

The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. I.

AUGUST 30, 1919

No. 11.

Contents

Editorial Notes: Nitrogen Products Report; U.S. Chemical Enterprise; Lessons from the Explosives Report; Swiss Dyestuffs; British Science and Key Industries ...	291
Mechanical Handling of Chemical Materials. (First article.) By G. F. ZIMMER, A.M.Inst.C.E.	294
Production Costs of Chilian Nitrate. By J. MARCO ...	297
The late Professor Vernon Harcourt (with photograph) ...	298
Germany's Chemical Factories ...	299
Future Possibilities in Artificial Rubber. By DR. E. K. RIDEAL, M.A., F.I.C.	300
Organisation of an Industrial Laboratory. By A. D. LITTLE and H. E. HOWE	302
British "Key" Industries: Import Restrictions on Chemicals	305
British Nitrogen Products Report ...	306
German Potash for Great Britain ...	307
From Week to Week ...	308
The Indian Market ...	309
References to Current Literature ...	310
Patent Literature ...	311
Market Report and Current Prices ...	314
Commercial Intelligence ...	317

NOTICES:—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- Abroad. Cheques, P.O.O.'s, and Postal Orders should be payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.
Telegrams: "Allangas. Fleet. London." Telephone: City 9027 (4 lines)

Nitrogen Products Report

DURING the past few weeks the delay in the publication of the report of the Nitrogen Products Committee has been subjected to some very frank criticism, which no apologist for the Government can contend is wholly undeserved. The Committee was appointed at a comparatively early stage of the war, shortly after Mr. Lloyd George had become Minister of Munitions. Its report is understood to have been completed some months ago. It deals with a national problem of first-rate importance. Yet for some reason unexplained the report, necessarily a document of high scientific and commercial interest, is held back. One theory is that publication is delayed pending the preparation of an index; as against this it is stated that the index has been prepared, and actually printed, for some time. In the absence of official information it is difficult to know what to make of the situation. One point is clear. There

has been ample time to arrange for the issue of the report, and if publication, in the face of the present demand, continues to be delayed the Government cannot be surprised at a considerable addition to the volume of suspicion with which some of its business doings are already regarded.

The reasons for the appointment of the Committee are well known. The large use of nitrogen products in the manufacture of explosives for war purposes resulted in an enormous increase in the demand. In addition an increased need arose for nitrates for fertilisation purposes. Our import of nitrates from Chile were exposed to submarine attack, and the failure of these natural supplies would have left us without essential material for explosives and for fertilisers. Germany, by the development of great works for the production of synthetic ammonia, had made herself largely if not completely independent of overseas supplies of nitrate, and it seemed time that we should make a serious effort to put ourselves in a corresponding position. By 1917 the Committee considered it practicable to start manufacture on a large scale in this country, and its interim report contains a recommendation to that effect. Steps were taken to establish the necessary plant at Billingham-on-Tees, at a cost reputed to be about a million sterling, but when the Armistice was signed the works had not reached the stage of actual production. Since then, apparently, the scheme has come to a standstill, and nobody knows whether the Government's intention is to treat it as so much war scrap. Yet the matter is one of such importance to the nation that inaction would be intolerable.

As to the Billingham-on-Tees establishment, two suggestions have been made: (1) That it should be completed and worked as a national enterprise; (2) that it should be disposed of to a private firm. There is not very much to choose between the proposals; the great thing is that the machinery brought into existence at a heavy cost should be used to the fullest advantage in the national interest. But this particular establishment is only a detail, though a large one, in the matter. The valuable scientific data which the Nitrogen Products Committee must have collected respecting the synthetic process of production cannot be handed over as a commercial monopoly to any particular interest; still less can it be allowed to remain pigeon-holed in some Government department. It is national property, and the Government will assuredly suffer from any further neglect to realise this plain fact.

As to the processes for the fixation of nitrogen, there is no need for any detailed discussion. It is far from true that we have done nothing, but our record of enterprise is not flattering. It is an old English failing to discover something of first-rate importance and leave others to exploit the discovery to our commercial disadvantage. In this matter Germany, as usual, has

been particularly active. But friendly nations have also shown more enterprise than ourselves. France, in 1915, made arrangements with an English company for the installation of plants costing some millions, and when America entered the war she took steps to erect similar works at Muscle Shoals, Alabama, for the manufacture of nitric acid and nitrate of ammonia from cyanamide on a very large scale. In view of the enormous demand for nitrate we cannot afford to look calmly on at other nations' activities. Our chemists are quite equal to the need, as they have always been; what is needed is the application of chemical knowledge on a sufficiently large commercial scale. The Nitrogen Products Committee's report should represent the last word on this important subject, and the continued delay in its publication is an injury to British science and to British commerce.

U.S. Chemical Enterprise

In striking contrast with our own official slackness, as illustrated in the matter of the Nitrogen Products Committee's report, is the energetic use which is being made in America of the scientific work done by the Chemical Warfare Service. The chemical journals of the United States are full of contributions from members of the staff, who are thus permitted and apparently encouraged to place the benefits of their technical work at the service of the chemical industry. Moreover, it is clear from reports that reach us that America is paying greatly increased attention to the chemical markets of the world. If anyone is in doubt as to the advance made by the United States the following table of the approximate volume of business done in 1914 as compared with 1917, given by Major F. E. Breithut in a review of the economic status of the American chemical industry, should convince him:—

CLASS.	1914.	1917.
1. Coal tar crudes, intermediates, dyes	\$25,000,000	\$70,000,000
2. Drugs and pharmaceuticals	68,000,000	150,000,000
3. Essential oils, flavouring and perfumery materials	8,000,000	10,000,000
4. Explosives	41,000,000	500,000,000
5. Fertilizers	203,000,000	258,000,000
6. Heavy chemicals	39,000,000	177,000,000
7. Mineral acids	26,000,000	100,000,000
8. Miscellaneous inorganic chemicals	55,000,000	100,000,000
9. Miscellaneous organic chemicals	115,000,000	215,000,000
10. Natural dyestuffs and tanning materials	31,000,000	56,000,000
11. Paints and Varnishes	149,000,000	175,000,000
12. Proprietary preparations	105,000,000	200,000,000
13. Soaps and glycerine	136,000,000	232,000,000
14. Wood distillation products and naval stores	35,000,000	76,000,000

Of this progress much will no doubt be heard at the annual meeting of the American Chemical Society which opens on Tuesday next at Philadelphia. Within sight of the historic hall in which the people of the United States declared their national autonomy, what is described as "American chemical independence" will be proclaimed next week. This year's assembly, it is confidently predicted, will be "the most significant that has ever been held"; it will be "the starting point of important new movements and the rallying place for leaders in the era of reconstruction." Scores of pro-

cesses and discoveries, we are told, which were the direct outcome of war emergency measures, will now have their application to the arts of peace; officers of the Chemical Warfare Service of the United States will be present to tell of developments which came under their personal observation, and many new applications of new-found knowledge will be suggested. Nor is individual enterprise less marked than this corporate enterprise of the American Chemical Society. An unnamed donor—believed, however, to be Mr. Charles M. Schwab—has voluntarily undertaken, at a cost of a million dollars, to build a new chemical laboratory for Cornell University, "fully adequate to the needs of the University, and one that will in all respects and size be the best there is in America." The new laboratory, which will more than make good the loss caused by the destruction of Morse Hall by fire some two and a half years ago, is expected to be ready for use by the spring of 1920. In our first issue we drew attention to the friendly rivalry which the British chemical industry must expect from the United States. Recent events tend to emphasise rather than to weaken the need of the warning.

Lessons from the Explosives Report

THE forty-third annual report of His Majesty's Inspector of Explosives, to which we referred in our last issue, is, of course, mainly of interest to the trade concerned, and will, no doubt, be fully dealt with by our contemporaries specialising in this subject. As is often the case with these reports, unexpected accidents—in this case explosions—are reported with substances of more general interest to the chemical industry, and we append notes on accidents in connection with petroleum and acetylene, which should be carefully noted by all who handle these products:—

Petroleum Accidents.—Two fatal accidents, due to the explosion of so-called empty drums which had contained petroleum, were reported to us during the year. In one case the drum had but recently been emptied, but in the other steps had been taken to remove all trace of petroleum by thoroughly washing out and rinsing the drum. The victim of the explosion, an experienced chemist, then put a light to the bung-hole, either to prove that no inflammable vapour remained or to burn out the residue, and a violent explosion followed. This accident is one more indication of the difficulty of rendering safe a vessel which has contained petroleum spirit, owing (1) to the density of the vapour, which is about two and a half times as heavy as air, and (2) to the very small proportion of vapour required to make an explosive mixture with air.

Acetylene.—An explosion of acetylene gas occurred at 279, City Road, E.C., on June 18. The generator stood in what was once an open yard, but which was afterwards roofed in with corrugated iron, covered by an earth mound, to provide a shelter against air raids. On the day in question the man engaged in charging the generator allowed too great a quantity of carbide to come into contact with water, thus causing an over-generation of gas, which, not being able to escape into the open air, found its way into an adjoining workshop where lights were burning. An explosion took place, wrecking the shop window, but doing very little other damage.

An explosion occurred at 9, Scrubb's Lane, Hammersmith, in June, shortly after an acetylene generator had been charged, breaking windows and demolishing the shed in which the generator was housed. The explosion was probably due to the accidental presence within the generator of an explosive mixture of acetylene and oxygen, the latter gas obtaining entry through the failure of one of the oxygen traps, which mixture was ignited by acetylide of copper formed by the action of acetylene on the

copper ball valves fitted in the generator. Owing to the difficulty of obtaining materials, copper balls had been fitted to some generators, but no more will be used.

A remarkable feature of the report is the fact that the casualties in the explosives trade during the war were only 25 per cent. greater than in 1910—a tribute to the efficiency of the inspectors of explosives and to the staffs of our explosives factories. If the casualties in the explosives trades are compared with those in other occupations, it may even elicit the fact that the explosives trade is relatively one of the safest forms of employment, the average being only 1.25 persons killed and 5 injured per 1,000 per annum. We have only one criticism to make of the subject matter of the report. On page 7 reference is made to the high proportion of accidents and deaths in the manufacture of TNT, picric acid, and dinitrophenol, "representatives of a type of explosive which, prior to the vast experience of the war, was universally regarded as comparatively free from danger." This is not correct as far as picric acid, at any rate, was concerned, and reference to the literature on the subject, and even to the reports of the inspectors of explosives themselves, will show not only that this substance has been considered troublesome and dangerous, but that a leading authority has even expressed the hope that its manufacture will ultimately be abandoned altogether.

Swiss Dyestuffs

At the British Dyestuffs meeting this week a question was raised as to whether we were getting German dyestuffs through America. Similarly, in America, manufacturers of dyestuffs are inquiring whether they are getting German dyestuffs through Switzerland. To the latter suggestion Mr. G. H. Wagner, director of the Sandoz Chemical Works of Basle, presents what looks like a good reply. At the outbreak of war, he points out, Germany placed an embargo on all coal-tar crudes and intermediates, with the result that the Swiss dye factories found themselves suddenly cut off from their principal source of supply. On the other hand, they faced an overwhelming demand for their finished products from all industrial centres outside the Central Powers, especially from England and the United States. The English dyestuff consumers and the British Government soon realised that the Swiss factories could be of material help to them, if properly supported by the supply of raw materials. The outcome was an agreement between the British Government and the Swiss dyestuff industry, whereby the British Government undertook the supply and transport from England to Basle of all raw materials which the factories would need for the continuance and development of their output, against the obligation on the part of the factories to return "a fair proportion" of their output to England. This agreement has later been confirmed in the form of what was termed a "chemical guarantee" given by the factories to the British and French governments. It has been in working operation over the full period of the war, and it is still in operation to-day. It enabled the Basle factories to supply England with an important quantity of dyestuffs and at the same time to continue their shipments to the United States during the period where the scarcity of

dyestuffs was critical to the American textile mills. Their source of supply of raw materials was not, since August, 1914, and is not to-day Germany or Austria, but principally England and in smaller degree France, Italy and the United States.

Further, Mr. Wagner states, the highly developed chemical industry in Switzerland has not been idle during the war. Switzerland, he claims, is completely independent to-day of outside supplies, for the principal alkalies, muriatic and sulphuric acid, including oleum, are manufactured in the country in sufficient quantities to cover all requirements, the pyrites coming from Italy. Large amounts of nitric acid are produced both at Shippis and Bodio, besides a number of other important products of electrolytical processes. The Basle factories, he declares emphatically, have never been "assembling points for German intermediates" and never will be. They have always produced a large amount of intermediates themselves and the considerable development which their plants have undergone during the war makes them completely independent of their former suppliers, both in kind and quantity. In addition to their Basle factories, they own and operate a large plant at Clayton, Manchester, entirely rebuilt, enlarged and fitted out with the most up-to-date installations for the production of raw materials and intermediates. The Swiss dyestuff industry has never had a more bitter competitor than the German dyestuff industry. Germany had hoped that the war would wipe that competition out once for all. Instead of that, the war has made it stronger and more independent than ever. Where, then, do the Swiss dyes come from? Certainly not from their enemies. Swiss skill and labour at home and abroad produce them and nothing else. The freedom and independence of every outside influence which the Swiss dyestuff factories have acquired during the war places them in a position to face with full confidence the further developments in the world's market.

British Science and Key Industries

It is announced that an exhibition similar to that held during July at the Central Hall, Westminster, is to be held at the Kelvin Hall, Glasgow, from November 17 to November 28. The exhibition is promoted by the Corporation of the City of Glasgow, and will be under the auspices of the British Scientific Products Committee and the New British Science and Key Industries Exhibition, London. Professor C. H. Desch is the chairman of the British Scientific Products Committee, and Mr. Edward J. Duveen of the Key Industries Section. We are glad to note that the organisation of this exhibition follows the lines of the suggestions made in our issue of July 12, inasmuch as a suitable charge is being made for space, and that a much larger hall is being used, the Kelvin Hall measuring about 250 ft. by 180 ft. We incline to the opinion that the key industry business has been rather overdone—that is not unusual in vigorous propaganda and educational work. It is to be hoped that at this exhibition the key industries of the country will be presented in their true perspective, and that adequate attention will be paid to a representative section of chemical plant and machinery.

Mechanical Handling of Chemical Materials

By George Frederick Zimmer, A.M.Inst.C.E.

At a time when increased production is so much to the forefront the question of the more general adoption of labour-saving appliances in chemical works must sooner or later be raised. Bearing this in mind, both those who are engineers as well as chemists and those who do not combine the two qualities will do well to follow Mr. Zimmer carefully through the short series of articles which he has specially written for us. As an expert he has come into touch with the subject of mechanical handling in all its phases, and he raises some novel points which are likely to arise when machinery of the kind is employed in chemical works.

I.

MECHANICAL handling devices employed in the chemical industry may perhaps be best characterised as having to conform to more specific conditions than those in any other branch of applied science. All the various attributes of the standard types of conveyor are applicable to one or other of a great many more or less difficult propositions. It is more than probable that the problem of handling some of the materials which it is essential should be handled by mechanical devices has not yet been solved, and such materials must thus be handled by human labour till a suitable mechanical method has been discovered. Another fact is also apparent concerning the handling in this industry, namely, that in the majority of cases the conveyors for chemical works will be for relatively small capacities; and, finally, there will be handling propositions which deal with coal and other more commonly handled bulk and piece materials, which latter need not, however, be investigated in this essay, as they are too well known, though they may be, none the less, important accessories applying to all industries.

As in all other handling propositions, the devices for chemical works may be divided into appliances which convey essentially in a horizontal and slightly inclined direction; these will be spoken of in the following as conveyors, while those which convey or elevate up a considerable incline, vertically, or partly inclined and partly vertically, are hereinafter termed elevators.

The writer believes that his contribution to THE CHEMICAL AGE may serve its purpose best if, instead of laying down hard and fast rules, he enumerates the applicability of the different handling devices for different conditions of material. Thus he will outline first the kinds of material which may have to be handled and by which particular devices, then the conditions which may, incidentally, have to be fulfilled by a handling installation.

Nature of Material to be Handled

If we outline the essential characteristics of different materials which might have to be handled in a chemical works they may be classified under the following six headings:—

- I. Coarse, dry mineral and vegetable substances, which do not easily deteriorate by a handling process.
- II. Coarse dry amorphous or crystalline substances, which are friable.
- III. Coarse moist amorphous and crystalline substances.
- IV. Fine dry powders.
- V. Fine moist material.
- VI. Viscous and deliquescent materials in all stages of fluidity.

Conditions to be Met

These are as follows:—

- A. Prevention of dust, in order to avoid injury and inconvenience to workers and loss to the establishment; also avoidance of explosion.
- B. Necessity of handling materials at a high temperature.
- C. Desirability of subjecting the material, while being conveyed, to a sifting, picking, heating, cooling, or similar process.
- D. Necessity of occasionally employing the same handling device for a variety of different materials.

We will now deal individually with the two main sections and the somewhat arbitrary classification under the ten sub-headings. The specific gravity has not been taken into account in the classification.

1. The Handling of Dry Mineral and Vegetable Substances which do not easily deteriorate

Both conveyors and elevators for the above purpose are devices of the standard type, and the same as are in use for coal, minerals, grain, and most material handled in bulk in other industries. For bulk goods of the heavier class of mineral origin the band conveyor, pushplate, tray, gravity bucket, and reciprocating conveyors are mostly used; also the worm conveyor if the material is not too coarse—say less than half the pitch of the worm. The elevators for this heavier class of material may run the full speed, and should be provided with one or two endless chains, and the buckets should be deep (see figs. 1 and 2), while for light material,

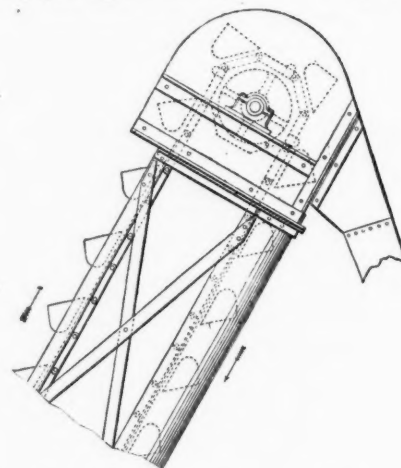


FIG. 1.—UPPER TERMINAL OF MINERAL ELEVATOR.

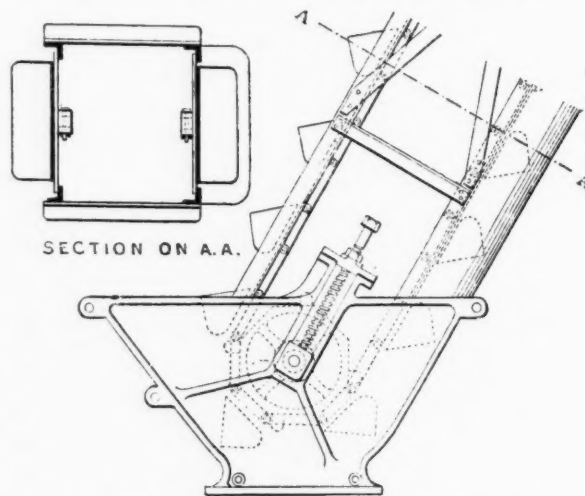


FIG. 2.—LOWER TERMINAL OF MINERAL ELEVATOR.

such as small bark, leaves, chips, nuts, and other vegetable matter, elevators should be employed as in figs. 3 and 4. Either solid woven or stitched cotton bands will suffice, while the buckets in some cases should be somewhat shallower. The materials under this heading generally run freely, and in most cases they need no special devices for feeding on to the conveyors and elevators, and they likewise deliver freely from the elevators. The conveyor types mentioned may be used for substances of vegetable origin, but the band conveyor and the reciprocating trough conveyor are preferable because longer pieces can best be handled by them. The worm conveyor is likewise suitable under the same reservation as above, *i.e.*, with the exclusion of large or long objects.

Altogether proposition I is the easiest and most straightforward. If conveyors have to feed into a series of receptacles,

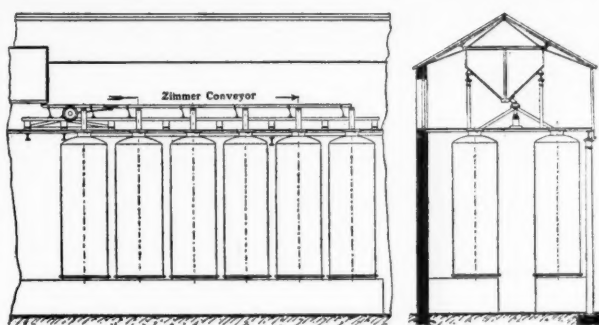


FIG. 5.—RECIPROCATING CONVEYOR IN A SUGAR WORKS.

II. The Handling of Coarse, Crystalline, or Amorphous Substances which are friable and which deteriorate by rough treatment.

According to the degree of friability a variety of conveyors may be used. For very friable material the band conveyor is best, as the material rests undisturbed upon it, and if rubber or cotton are not desirable, owing to the chemical nature of the load, a thin flexible steel band may be used, or a slat or tray conveyor. None of these types are suitable for intermediate delivery except the flexible steel band, and should this be desirable a slow-running band, 100 ft. to 200 ft. per minute, with an oblique plough to scrape off the material at any desired point, will answer the purpose. These ploughs are either hinged at the position where they are to be used, and raised out of the way or lowered as desired, or they can be made portable on wheels and placed in any position. The textile rubber band may also be used in this way, but only if the band runs at, say, not more than 60 ft. per minute, and if the material is not of a cutting nature, otherwise the band will soon wear out. Tray conveyors may be specially modified for the purpose of giving intermediate delivery, when they are termed tipping-tray conveyors, which will tip off the load at any desired point by the aid of a tripper, which can be adjusted in any position. The gravity-bucket conveyor is also suitable, but cannot be recommended except where the material has to be elevated as well as conveyed.

A matter which is obviously of importance when handling friable stuff is to avoid all unnecessary drop on and off conveying devices. Bucket elevators should be avoided, but where they are used they should be inclined, and run so slowly that the material drops out of the buckets by gravity. The so-called vertical dump elevators (see fig. 6) are best for this purpose if there is not room for inclined elevators. Where conveying and elevating is necessary it is always preferable for friable stuff, not to have a separate conveyor and a separate elevator, as that means a drop at the point of transference, but rather to have one device for the dual purpose. A tray or tip-tray conveyor may be used with advantage, and for a very gradual incline, not more than 20 per cent., a slow running band conveyor may be used in the same way, and if intermediate delivery is necessary, preferably one of steel. Where a drop is unavoidable from or to an elevator, conveyor, or other receptacle, a chute must be used of an incline at which the material will only just slide down, and if space is not available where a long chute for this purpose would be necessary, a helical or spiral chute is best in order to lower the material gently. In short, for handling of friable stuff, all devices with a pushing or dragging action must be avoided. All those mentioned above support the material, and it lies undisturbed throughout its journey. If the material is only slightly friable a reciprocating trough conveyor of the Zimmer type (see fig. 5) may be used as the slight hopping motion will not injure any but the most friable materials, but this latter

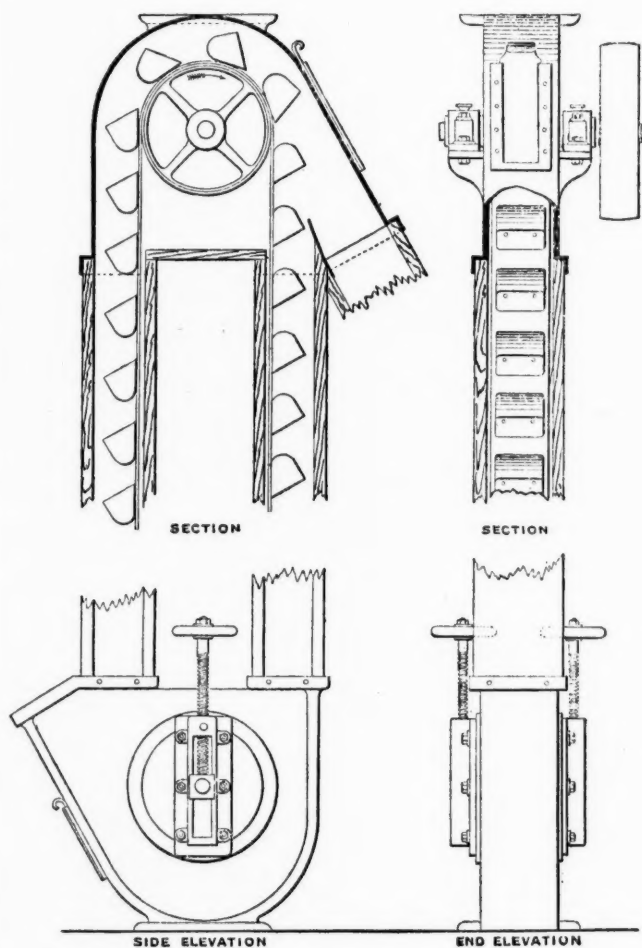


FIG. 3 AND FIG. 4.—TWO VIEWS OF ELEVATOR FOR VEGETABLE AND OTHER LIGHT NON-FRIABLE SUBSTANCES.

say either into a battery of vessels, or hoppers over such vessels, or into a row of grinding or mixing machines, the band conveyor is less suitable, and should therefore only be used for handling very large quantities, as this machine cannot give intermediate delivery into such a row of receptacles without a somewhat complicated and costly throw-off device. On the other hand, the pushplate, worm, and reciprocating conveyors can discharge through outlets at any number of pre-determined points by merely opening slides. (See fig. 5, which shows two rows of vessels being charged with animal charcoal.)

type has the disadvantage that it can only be used as a conveyor, and if the material has to be raised, a bucket elevator would have to be used in conjunction with it, and this, as we have seen, is better avoided.

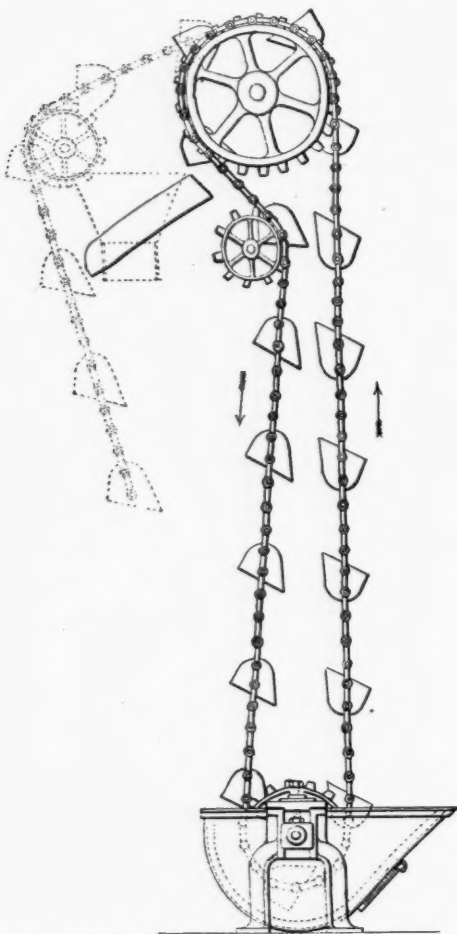


FIG. 6.—VERTICAL DUMP CONVEYOR, SHOWING ALSO MODIFICATION OF THE SAME PRINCIPLE.

III. The Handling of Coarse Moist Substances.

In this proposition the conditions are fundamentally similar to those under Heading I. A slight drop will obviously be of less detriment, but the conveyors enumerated under Heading II are, none the less, preferable, since the pushing along of moist substances will in all cases where there is a tendency to stick, be detrimental. And if used the trough will soon have a crust; this does not, however, apply where the moisture is merely external or superficial, as would be the case with a substance such as washed coal or gravel, for which almost any type of conveyor could be used. For sticky substances of clayey nature, the flexible steel band is undoubtedly the best conveyor. This must be provided with brushes, wipers, or scrapers, according to the degree of stickiness. These latter devices are not very applicable to textile bands, which are, on that ground, to be avoided, as the wear on the band would be considerable. A worm conveyor is quite useless for sticky substances, as it will in a short time fill up into one solid revolving mass and cease to be a conveyor. These spiral conveyors will, however, be very suitable if the wet substance is not sticky, but of the nature of washed coal. Reciprocating conveyors are also suitable. Such a conveyor is, for instance, in use

at a Lancashire copper works, handling sulphate of copper crystals fresh from the mother liquor.

With elevators the position is similar. Stuff of the nature of washed coal can be handled by the same elevators as dry material in Class I, with the reservation that chains only and no textile bands are to be used for the support of the bucket. For substances of the consistency of clay it is very difficult, if not impossible, to find a suitable elevator, and wherever possible, an inclined steel band or slat conveyor is recommended. The flexible steel band is best, but an articulated band known as the apron conveyor will also do. For a longer lift, and if the material is not very sticky, a bucket elevator with extremely shallow buckets, or merely metal angles or rakes, has been used, but such a device is likely to give constant trouble, and the skip hoist, like those used for the removal of ashes from boiler houses is the best device. It is not continuous working like all the elevators and conveyors previously mentioned, as it has only one or two buckets, and works intermittently. The buckets have, moreover, to be filled by hand, or from an overhead receptacle; but even in this case the material will not feed into the bucket without manual assistance, and similar aid is necessary at the top terminal to free the material at the discharge. A feeding device in connection with a bucket elevator is necessary for most of the material under this head. It consists of a revolving disc and a scraper, by which the amount of feed can be adjusted.

New Fuel Research Station

RAPID progress is now being made with the completion of the Fuel Research Station at East Greenwich, after much delay principally due to important departures from the original plans of the building. The station is an experimental one, established by the Government to ascertain the extent to which low-grade coal and colliery waste can be utilised to increase the country's supply of domestic and industrial fuel. The undertaking has been in hand for more than two years, and it is now expected that the plant will be so far complete by the middle of September as to enable operations to be begun.

The plans had been ready, following the report of the Fuel Research Board, in December, 1917. These were for a brick building carried on piling, that type of structure having been selected in agreement with Dr. Charles Carpenter, chairman of the South Metropolitan Gas Company and a member of the Carbonization Sub-Committee of the Reconstruction Committee. At this stage, however, the Office of Works intervened and took over responsibility for the erection.

The central tower, a steel structure, which forms the starting-point of the coal's treatment, is now being placed in position. The offices and laboratories are complete, and the gasholders are all ready. To supplement the power plant, which is electrical throughout, the Admiralty have supplied a Diesel engine set taken from a British submarine, and have lent the services as chief engineer for three years of Engineer-Commander Shaw, who was chief engineer in H.M.S. *Invincible*, and took part in the Falklands fight. The services of Professor Thomas Gray have been lent by the Royal Technical College, Glasgow, as chief of the laboratory and chemical staff.

The station, the site of which has been leased to the Government by the South Metropolitan Gas Company, is stated to embody a unique system for accurately determining the fuel value of coal and its products. Exact tests are to be carried out with special boilers of the comparative efficiency of coal, gas, and oil in the furnaces. Experiment will be particularly directed to ascertain the maximum capacity of coal to yield motor spirit. It is not intended to deal at once with colliery refuse, but to confine experiment meanwhile to standard coal.

Book Received

"The Occlusion of Gases by Metals." A general discussion held by The Faraday Society, November, 1918. Reprinted from the Transactions of the Faraday Society, Vol. xiv, Parts 2-3, 1919. Pp. 93. 8s. 6d.

Production Costs of Chilean Nitrate*

By J. MARCO.

As the synthetic processes for the fixation of nitrogen are causing world-wide interest and discussion in regard to the possibility of their competing with the deposits of Chile, it is of interest to ascertain economic conditions which will affect the future of the Chilean nitrate industry. Of these, cost of production is the most important. As Chilean nitrate furnishes approximately 58 per cent. of the total fixed nitrogen used in the world and the producers have always had conditions in their favour, many of the factors influencing cost of production to them have been overlooked. It is, therefore, desirable to study the possibilities of lowering this cost of production under commercial competition.

It is traditional that the nitrate industry in Chile has not been administered according to principles of scientific management, and the great savings in cost made in other lines of production by the adoption of business economies lead one to believe that savings could also be made in the mining, extraction, and transportation of nitrate. The managers of the nitrate plants in Chile in obtaining statements of the profits and losses in their business have heretofore depended entirely on the annual or semi-annual balance obtained by the accounting department when the books were closed and an inventory taken. As a result, no one knows the itemised costs of the various details of the business and it is not possible to determine at any time the advantage or disadvantage which any modification in methods might produce. A system of cost accounting is, therefore, of great importance to the improvement of the industry. The facts given below are not, therefore, the result of accurate statistics from the books of the companies, as the books would not give such precise information; they are rather the result of observations made upon the ground, the figures being in accordance with the conclusions arrived at by many observers. The cost of Chilean nitrate on board ship may be divided into the following items:—

A—Cost of mining and transportation of the caliche (raw material) from the deposit to the extraction plant.

B—Plant costs of manufacture (product 95 per cent. NaNO_3 .)

C—Cost of transportation from the plant to the ship.

D—Administration expenses.

We will consider these items in the above order.

A—This cost varies from \$0.79 to \$1.40 per short ton of caliche delivered at the Oficina (extraction point).

The mining of the caliche is practised in a very primitive manner, most of the time without knowing the quality of the material dug. This makes it impossible to maintain a uniform extraction cost on account of the variation in the quality of the material and the distance to the plant. If profits are to be realised the composition of the mineral taken from the ground should be followed and it may be possible in times of high prices to extract poorer material at a profit than could normally be done. Furthermore, most of the mining is hand labour and there is, naturally, a broad field for development in the use of mechanical devices. Transportation from the deposits to the plant is also done by means of wagons drawn by mules, and the cost of production can undoubtedly be lowered by the use of trucks or other mechanical devices.

Labour is at present 70 per cent. of the expense. A decrease in wages cannot be expected as only first class labour can be used. Such labour now obtained gets from \$1 to \$3 per day.

B—The cost of extraction of one short ton of caliche is now \$0.90 to \$1.37. The principal factors of costs are labour, 30 per cent.; fuel, 60 per cent.; and technical control, less than 1 per cent. Technical control and advice have been practically forgotten in the Chilean nitrate industry on account of the control of the nitrate markets which the Chilean industry has heretofore maintained. There is no question but that technical advice and control will lower costs. Some plants, for example, now extract no more than 55 per cent. of the nitrate contained in the material, while others, in exceptional cases, get as high as 72 per cent. There is, however, a change taking place in this respect. Chemists and other technically trained men are being engaged in research which will undoubtedly lead to an increase in the percentage extracted and to a reduction in the amount of fuel used. Indeed, toward the close of 1918, El Instituto Tecnico del Nitrato was established in Chile with this object in view.

* From the *Journal of Industrial and Engineering Chemistry*.

Of the total fuel used, 20 per cent. is devoted to the production of power and 80 per cent. to the production of heat. The installation of the Diesel type of motor in power plants has given good results and many central thermoelectric power plants are being planned to serve a number of Oficinas collectively. Under the present method of heating, 65 per cent. of the fuel is not utilised but it is expected that with the adoption of new models of boilers and evaporators, and new methods of chemical procedure these losses will decrease. Lately a process devised by Manuel Prieto, chemical engineer, has given satisfactory results for extraction, obtaining during the test made an extraction as high as 75 per cent. even with poor raw material.

C—The costs of transportation from the Oficinas and placing on board ship are about \$18.00 a short ton of commercial nitrate. The export tax paid the Chilean government forms the chief item of this expense or 65 per cent. of the total (56 c. a quintal equals 101.6 lb.). The government has under consideration a more rational principle of applying this export tax, the adoption of which will make it possible to exploit poor fields of nitrate. The construction of up-to-date docking facilities at the port of Antofagasta has already been begun and improvements in railroads facilities throughout the nitrate zone are continually being made.

D—The costs of administration are approximately 38 to 60 cts. per short ton of caliche. This item probably cannot be reduced, but the adoption of better systems of management should increase the efficiency of production. Last year, under the auspices of the Chilean government, all the manufacturers of nitrate joined together in an attempt to solve many of these important commercial problems.

The following table gives the actual results obtained in four Oficinas:—

SUMMARY FOR THE YEAR OF OUTPUT OF FOUR EXTRACTION PLANTS.				
	I.	II.	III.	IV.
Production, short tons of commercial nitrate ..	39,600	73,800	34,200	85,200
Average per cent. of sodium nitrate in the caliche ..	17	21	16.5	18
Efficiency of extraction, per cent. ..	64	70	62	65
Lbs. of nitrate extracted per short ton of caliche ..	213	294	204	234
Cost* per short ton of commercial nitrate at the plant, A B D factors, dollars ..	18.00	13.40	20.60	14.60

*The exchange value of the Chilean peso was equivalent to 12d.

It is therefore, hoped and expected that economies may be made in the mining and marketing of sodium nitrate and that it will for some time pay to compete with the synthetic nitrogen.

British Dyestuffs Meeting

SIR HENRY BIRCHENOUGH, presiding on Tuesday at the statutory meeting of British Dyestuffs Corporation (owing to some delay in the arrival of Lord Moulton, the chairman), stated, in reply to a question, that 9,900 applications were received direct from the general public in response to the prospectus. These applications represented 3,276,000 shares, or approximately two-thirds of the total issue, and 876 applications were received through the underwriters, representing approximately one-third of the total issue. In view of the fact that the prospectus was issued immediately after the Victory Loan, and that the industrial outlook at the time, owing to the coal strike in the Yorkshire area, was not encouraging, the directors considered the response of the public to have been very satisfactory. (Hear, hear.) The total number of shareholders was now approximately 12,000.

Mr. Fay inquired if any foreign dyes were at present coming into this country, and, if so, from what source?

Lord Moulton said that foreign dyes were coming into this country from Switzerland, but only in small quantities. He believed none were coming in from any other source, and these were coming in relief of the needs of England, because it took some time before the full list of dyes could be produced.

Mr. Beaumont asked if it were not the fact that a good quantity of dyes were coming here from Germany through America?

The Chairman replied that the Board had no positive knowledge, but he did not think any dyes were coming into this country at the present time from Germany by way of America.

A number of other questions having been answered, the proceedings closed with a vote of thanks to the chairman.

The Late Professor Vernon Harcourt

Professor A. G. Vernon Harcourt, who died on Saturday in the Isle of Wight, in his eighty-fifth year, had not only a long but a highly distinguished career as a chemist. Elder son of Admiral F. E. Vernon Harcourt, he was born in 1834, and educated successively at Cheam, Harrow, and Balliol.

THE *Times*, practically alone among English journals, published a full and interesting sketch of his life and work. According to the well-informed writer, it was at Balliol, under Henry Smith, that Professor Harcourt laid the foundation of his chemical career. Harcourt, in his reminiscences of the Oxford Museum and its founders, has told us how, when Salvin's Buildings at Balliol were constructed early in the fifties, two cellars were appropriated to the study of chemistry, and to provide a teacher Henry Smith, ablest of Oxford men, was deputed by the College to take some lessons in the subject. He went for a few months to Dr. Hofmann at the College of Chemistry. Montgomerie, Hertford Scholar in 1854, and Harcourt were his first pupils.

When Brodie, also a Harrow and Balliol man, later a pupil of Bunsen, returned to Oxford as Professor of Chemistry, the Balliol cellars were placed at his disposal, and Harcourt became first his pupil and then his assistant. At Balliol, Brodie began working on the peroxides of the acid radicals, and afterwards on the oxidation of graphite, and then turned to the systematic study of alkaline peroxides, whose reducing action he was the first to explain—incidentally supplying a strong chemical argument in favour of the diatomic nature of oxygen. In 1858 Brodie migrated to the chemical department of the new museum, and took Harcourt—still an undergraduate—with him as lecture assistant. A year later Harcourt was appointed Demonstrator in the students' laboratory known from its prototype as the "Glastonbury Kitchen," and among his first pupils there was the Prince of Wales, afterwards King Edward VII.

In the summer of 1858 Harcourt gained a first class in the School of Natural Science, and in 1859 was elected a Student of Christ Church and Lee's Reader in Chemistry. For six years he continued to work under Brodie at the University Museum, and then moved into the Lee's Laboratory at Christ Church, vacated by Dr. George Rolleston on his election to the Linacre Professorship of Comparative Anatomy. At Christ Church, Harcourt continued the investigations which he had begun in the museum on the Rate of Chemical Change, and here for nearly forty years he and his pupils maintained a small but active school of chemical research, a school which had for its object the study of general laws rather than the structure of organic substances or the synthesis of new compounds.

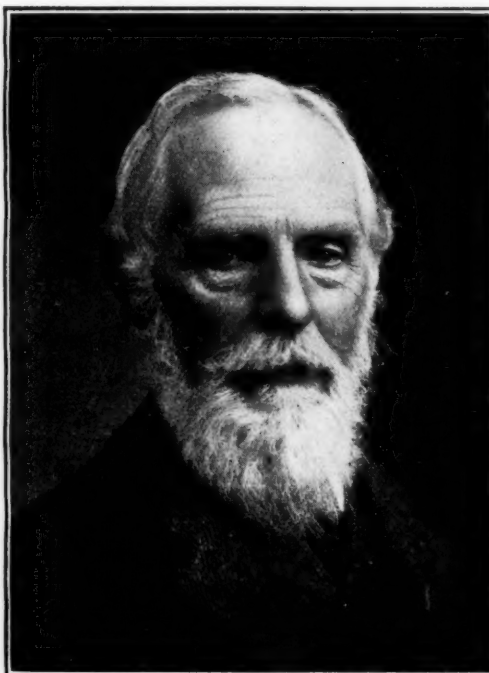
"Mass" and Chemical Action

The influence of his master Brodie can be plainly traced in Harcourt's chemical career. Brodie's work on the alkaline peroxides led Harcourt in the first place to investigate the conditions under which oxygen was absorbed by the metals potassium and sodium, and secondly to investigate the course of a chemical change in cases where the reactions occur slowly enough to be followed throughout their progressive stages. In his first paper Harcourt established the formulæ of potassium and sodium peroxides by experiments as simple and well designed as they are conclusive; and then began to study the course of such oxidations as those effected by permanganic acid and hydrogen peroxide, with the object of determining the law connecting the rate of a given chemical action with the quantities of the reacting substances. In this investigation Harcourt had the good fortune to be associated with a mathematician of peculiar gifts, William

Esson, of Merton College, and the co-partnership was one of the happiest, both in the inspiration and development of the research and in its presentment to the scientific world.

The bold generalisation of Berthollet—that chemical change was not an action independent of mechanical laws, but that the amount of change was governed by the "mass" of the reacting substances as well as by chemical affinity—remained for his own and for two succeeding generations of chemists a brilliant but unworkable idea. Bunsen, indeed, had published experiments on the explosion of gases which appeared to contradict directly the law of mass-action. To the chemists trained in the new school of Gerhard, Wurtz, and Cannizzaro abroad, and of Brodie and Williamson in England, is due the recovery of sane views on the mechanics of chemistry; and the three prime factors in this change were the work of Berthollet and St. Giles in France, of Guldberg and Waage in Norway, and of Harcourt and Esson at Oxford.

It was not at once, but only after long search, that Harcourt found a reaction simple enough to be followed throughout without complications caused by secondary actions due to the products of the primary change. But at length he hit on the action between hydrogen peroxide and hydrogen iodide, which proceeded with the necessary simplicity and at a convenient rate for study. With apparatus as simple as it was effective, Harcourt and Esson showed that when the conditions of the experiment were kept constant, the rate of the chemical change was strictly proportional to the mass of the reacting substances; and with the same apparatus they were able to show the effect of temperature on the rate of the chemical change, and so accurately could the changes be followed that they were able to calculate the absolute zero of chemical action—a datum in surprising agreement with the absolute zero of temperature obtained by physical methods.



Elliott & Fry.

THE LATE DR. VERNON HARCOURT.

Physical and Applied Chemistry

Though one of the pioneers of physical chemistry, Harcourt remained a sceptic towards the new theories of solution and ionisation, and the word "dissociation" was anathema to him. In his last address as President of the Chemical Society, in 1897, he maintained that the distinction between dissociation and decomposition was absurd. He declared, "A journey is the same journey whether I go with a return ticket or whether I cannot return by the same route." Of the painstaking character of Harcourt's demonstrations, of his insistence on neatness and cleanliness, of the patience and trouble he took with each beginner, and of the personal charm which endeared him to his students, generations of old Christ Church men can speak with grateful appreciation. The *minutiae* of manipulation appealed to him, but they were only means to attack the largest problems; for him no defect was too small to remedy, no authority was too great to question. Through the inspiration of his example and teaching Oxford, no less than English chemistry, has been intellectually quickened.

In applied chemistry Harcourt was chiefly drawn to questions dealing with the purification and testing of coal gas, he having been appointed (in 1872) one of three Metropolitan Gas Referees, whose duty it is to prescribe the mode of testing the London gas, and—subject to the various Acts of Parliament—to fix the limits of impurity allowed. One of his early researches on coal gas was

his attempt to purify the gas from sulphur compounds by means which he devised for converting the carbon disulphide into hydrogen sulphide. Harcourt's "sulphur test" came into wide use, but its application on a large scale for the purification of coal gas has only recently been carried out successfully by Dr. Charles Carpenter at the South Metropolitan Gas Works. Perhaps the most signal improvement in the testing of gas effected by Harcourt was the introduction of the Pentane lamp as the official standard of light in place of the variable spermaceti candle. His original one-candle lamp has been replaced by the more convenient ten-candle Pentane lamp, and this has been largely adopted as the measure of illuminating power, not only for gas, but for other illuminants.

Of recognition by learned societies and of devoted service rendered in return Harcourt could claim a large share. Elected to the Chemical Society in 1859, he served as one of its secretaries for eight years, and became President in 1895. In 1910 he was one of the five past presidents whose jubilee as Fellows was celebrated by the society. As became the nephew of one of the founders of the British Association—the Rev. W. Vernon Harcourt—he early took an interest in its meetings, and made many contributions to the Chemical Section, of which he was president in 1875. A few years later he was elected one of the general secretaries of the Association, an office he held for fourteen years with conspicuous tact. He was elected Fellow of the Royal Society in 1868, and served on its council, 1878-80. He was an honorary doctor of Oxford, McGill, and Durham Universities.

Germany's Chemical Factories

Impressions of an American Eye-Witness

LAST week we published some impressions by Dr. E.C. Worden, who recently visited Germany on behalf of the United States Aircraft Board, on the present condition of Germany's chemical industry. It may be interesting to supplement Dr. Worden's views by those of an American chemist, Mr. Philip Drinker, who accompanied him. Mr. Drinker has communicated to Dr. Samuel Isermann, of the Chemical Co. of America, New Jersey, the following account of his observations. It should, perhaps, be added that the statement was prepared "to be used in assisting the promotion of a protective tariff Bill in the United States," and that purpose should be kept in mind as possibly giving a little unconscious colour to the narrative with a view to producing the desired political effect in the United States:—

In company with Dr. Edward C. Worden, consulting chemist to the U.S. Air Board, I visited the following localities: Leverkusen, Troisdorf, Knapsack, Mainz, Kelsterbach-am-Main, Ludwigshafen. As we were interested only in the chemicals having to do with the coating of airplane wings, we made no attempt at a detailed inspection of the factories, but even in the brief time (June 7-17) in which we were in these localities, I was most strongly impressed by the splendid condition of all their factories and the air of general preparedness and prosperity in evidence throughout these districts.

At Leverkusen, we visited the Bayer Chemical Co., who also have a large factory at Elberfeldt. By the terms of the Armistice all materials entering and leaving the factory were subjected to rigid control by the allied military governors and, according to the Bayer chemists, this naturally cut down much of their normal output. They were doing a certain amount of work in the manufacture of dyes, pharmaceutical products, cellulose acetate, &c. This company advised us that they had built a large plant near Leverkusen for the manufacture of explosives and from the general appearance of the Leverkusen factory it was very evident that they were fully prepared to offer their products in foreign markets as soon as permitted. The pre-war quality of their dyes, drugs, &c., is, of course, well known, and I see no reason why this high standard should in any way be lowered now that peace has been signed. The factory is absolutely intact and, being one of the largest and most prosperous in Germany, it would be most natural for them to use it to its maximum capacity in assisting them to bring money into the country.

At Troisdorf and Mainz we visited factories engaged in the manufacture of cellulose acetate and products in which it is used. The Troisdorf plant (Westphalische Anhaltische Sprengstoff A. G.) was built entirely during the war and appeared to

be in excellent condition and under competent management. Samples of their product were furnished us and were of excellent quality, while the price is not quite so high as that of the same article in France, and this, in spite of the exceedingly low value of the mark at the date of our visit (1 mark equals 8 cents).

At Knapsack a large plant had been built during the war for the manufacture of calcium carbide, cyanamide, synthetic acetic acid, ammonia, &c. The acetic acid plant we did not see, as this was a secret process, but we went over the cyanamide plant with the chief engineer and were much impressed by the design, construction and method of operation. As it is a large factory and the demand for cyanamide as a fertiliser will probably be considerable, there is little doubt that this factory will be used to the limit when normal conditions are restored.

At Ludwigshafen we saw the nitrogen fixation portion of the Badische Chemical Co., and were conducted through by a French officer thoroughly familiar with the plant and its technical operation. Conditions are best shown by the fact that at the time of our visit they were actually constructing important additions to the plant and this was before peace had been signed. I observed five huge warehouses for storing ammonium products, such as ammonium nitrate and ammonium sulphate, with capacities of about 50,000 tons each. The nitrogen fixation plant was entirely constructed during the war and is consequently the last word on the subject. We were informed that the German government advanced something over 200,000,000 marks for its construction and operation and also that the counterpart of this factory was located on the opposite bank of the Rhine. It is due mainly to the efforts of this concern that the German government was enabled to carry out their programme of powder manufacture. The size and importance of the plant was well known to the Allies during the war, and was consequently subject to numerous air raids. Elaborate precautions were taken to minimise the effects of bombs, and so far as I could observe the factory at the time of our visit was absolutely intact. There is no doubt whatever that they are ready and intend to work it to its maximum capacity to supply ammonium compounds for fertilizers and other purposes.

The general condition of affairs in the districts visited left me with a strong impression of their industrial preparedness and their desire to offer their goods in the foreign market. As the factories in the unoccupied district were practically untouched I can see no reason to believe that they are not in the same condition as those visited.

To protect our own industries, which have been fostered and grown up during the war, a tariff will be most necessary. We all know the quality of the German chemical products and there are many who will be prone to buy in the German market if their goods are cheaper than our own.

United Premier Oil and Cake Co.

At the statutory meeting of the United Premier Oil and Cake Co., Ltd., on Tuesday, the Chairman (Mr. Herbert Guedella) referred to the successful amalgamation scheme, and said that by this combination of interests they had succeeded in establishing a complete unit of manufacture. The amalgamation had produced both efficiency and economy, and the material results to date had exceeded their expectations.

With reference to the coal position, he said, we are not very important users of coal, but having regard to recent events we are seriously considering the expediency of running the various works with oil instead of coal. Even at present coal prices the oil fuel is more expensive, but as against this factor we could ensure the continuous running of the various plants without the constant fear that at any moment our fuel supplies might fail us. There must be many other works in this country in a similar position to ours producing essential products in which it is not absolutely necessary to use coal, and I think it is the duty of the Government to encourage in every way possible, in the peculiar circumstances of the whole position, the use of any other fuel that may be available. The high price of oil militates against its use, and surely it would be a wise step for the great oil producers to forego some of their profits and to lower the price so that users might be encouraged at the present time. We have arranged for our financial year to end on December 31 of each year, and the results to date have been exceedingly gratifying, so that I think it would be safe to predict that the Ordinary shares of the company will receive a substantial interim dividend before we meet again.

Future Possibilities in Artificial Rubber

By Dr. E. K. Rideal, M.B.E., M.A., F.I.C.

Recently a good deal has been heard of the possibility of producing rubber synthetically, and although some progress is being made with artificial methods there would seem to be little prospect of the plantation rubber market finding anything in the nature of a serious competitor. Dr. Rideal discusses the synthetic processes in the following article, and shows that the plantation industry is likely to be made more productive by the elimination of such drawbacks as fungoid diseases, etc.

THE possibility of the synthesis of caoutchouc was first foreshadowed by Greville Williams in 1860, who noted that isoprene, when allowed to stand in contact with air for a few months, gradually lost its fluidity and became converted into a white spongy mass—the first specimen of synthetic rubber.

These investigations were continued by Bouchardat in 1875, but no general interest was taken in the matter until Tilden, in 1906, exhibited a sample of the synthetic material at the York meeting of the British Association. In 1912, at the Congress of Applied Chemistry in New York, Duisberg, of the Bayer firm, exhibited two motor tyres and a number of tennis balls prepared from synthetic rubber, thus indicating that artificial rubber could actually be manufactured. During the period of the war, when the shortage of plantation rubber in Germany naturally became exceedingly acute, the Bayer firm erected a synthetic rubber plant capable of an output of 2,000 tons a year.

At first sight it would appear probable that plantation rubber would follow the fate of vegetable indigo, and practically disappear from the world's markets, or become, at least, an insignificant competitor with the synthetic material. A closer analysis of the existing state of affairs, however, reveals the fact that the conditions obtaining at present by no means favour this course of events, and that the plantation rubber industry is likely to be permanent for many years to come.

In the first place, the world's rubber consumption is extremely large; although bought and sold by the pound, the annual world consumption runs into hundreds of thousands of tons, as is indicated by the following figures:—

Year.	World consumption in long tons.
1916	201,598
1917	265,698
1918	241,579
1919	350,000 (estimated)
1923	450,000 ,,

Over 80 per cent. of the total rubber consumed is produced within the confines of the British Empire, and only 45,000 tons are obtained from non-plantation sources, such as wild rubber.

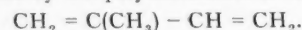
Thus any synthetic process, in order to achieve its aim, would have to be developed on an extremely large scale, necessitating a large capitalisation.

The conditions for the development of a synthetic rubber industry are equally unfavourable as regards cost. The average price obtained for plantation rubber in 1918 was 2s. 3½d. per lb. in spite of the difficulties of production and transport occasioned by the war. It would appear possible that, under normal conditions, some of the plantation companies which are favourably situated as regards latex collection and transportation, and which pursue a forward policy as regards the installation of labour-saving machinery, could actually deliver rubber to the consumer at from 9d. to 10d. per lb., and still maintain an appreciable margin of profit. Furthermore, the productivity per acre of the existing estates is likely to increase, owing to the gradual elimination of fungoid diseases and pests, from a study of the optimum conditions

of growth as affected by fertilisation, and, in addition, systematic experimental selection and crossing of various rubber latex trees or plants always envisages the possibility of elevating the annual crop derived from the plantations.

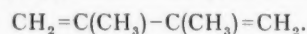
Synthetic rubber would therefore have to be produced in the neighbourhood of 1s. per lb. if it were to be a successful competitor with the natural product, unless it could command a higher price by showing some very marked superiority which rendered it more suitable for special purposes.

We have already referred to the fact that the first synthetic rubber was made by the polymerisation of isoprene,



Tilden in 1884 suggested that the other butadienes, the homologues of isoprene, should undergo similar polymerisation to rubber-like bodies, and during the last decade Tilden's observation has received repeated confirmation. Various methods for the technical synthesis of rubbers have been proposed, all involving the synthesis of a butadiene and its subsequent polymerisation to a rubber. Only a few of these offer any prospect of a technical success, owing either to the high cost of the raw material—e.g., turpentine—or to the complexity of the manufacturing processes, frequently accompanied by low yields.

Of the butadienes for which some prospect of a technically successful synthesis is held out may be mentioned butadiene itself, $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$; isoprene or methyl butadiene, $\text{CH}_2 = \text{C}(\text{CH}_3) - \text{CH} = \text{CH}_2$, from which natural caoutchouc is derived; and dipropylene or dimethyl butadiene,



For the production of butadiene on a technical scale two processes among the many which have been suggested from time to time would appear to offer some measure of success, utilising carbohydrates, such as maize or hydrolised wood, and hexahydrobenzene, prepared by the catalytic hydrogenation of benzene, as raw materials respectively. The process in which carbohydrates are utilised as a raw material was developed by Fernbach from some observations of Ehrlich on the peculiar fermentation which sugars underwent in the presence of a small quantity of ammonia or albuminous material, with the aid of certain organisms, such as *B. butylicus*. It was found that under suitable conditions the sugars could be converted into a mixture of acetone and fusel oil instead of the ethyl alcohol ordinarily so produced. The actual cost of conversion of the starches into these substances is actually not much greater than that for the production of alcohol, but very special precautions have to be taken to ensure the presence of an active organism in the fermentation vats, and failures to obtain good yields are somewhat frequent.

The fusel oil and acetone are removed by distillation, and can both be employed as a source of butadiene or its homologues.

The conversion of the acetone—which can be obtained in the above manner or from other sources, such as acetic acid, either natural or synthetic—into dipropylene is said to be easily accomplished, with over a 70 per cent. yield, by condensation with magnesium amalgam to pinacone, followed by catalytic dehydration with the aid of alumina maintained

at 400° C. It is suggested that the butyl alcohol obtained from the fusel oil may be chlorinated to give the dichlorides, and then converted into butadiene by heating with soda lime; the yields obtained by this method, however, appear to be rather poor. Further, it is evident that to produce 1 lb. of butadiene nearly 1½ lb. of chlorine would be required, and since the present price of chlorine is approximately 6d. per lb., the method does not appear very promising.

The economy on paper of the alternative process—viz., from cyclohexane—is much more favourable. According to a patent taken out by the Bayer company, cyclohexane, when passed over aluminium silicate maintained at 600° C., undergoes thermal decomposition, and a good yield of butadiene is said to result, presumably according to the reaction—



If only a 50 per cent. yield were obtainable by this process it would prove exceedingly economical, since taking benzene at 1s. per gallon and hydrogen at 6s. per 1,000 cubic feet, 84 lb. of hexahydrobenzene or 27 lb. of butadiene (assuming a 50 per cent. yield) could be produced for a cost in materials of 19s. The operations of hydrogenating the benzene and of pyrogenetic decomposition of the cyclohexane are both catalytic, and involve no large plant or costly running expenses, part or the whole of which would be recovered by utilisation of the other bye-products.

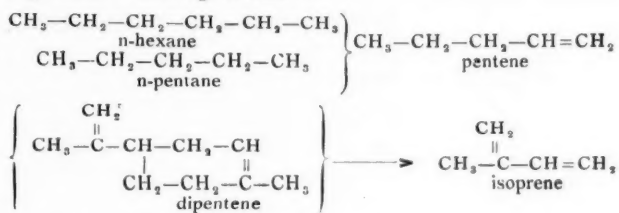
The production of the other important homologue of butadiene—viz., isoprene—has been the subject of an even more exhaustive inquiry than butadiene itself. The isomyl alcohol fraction of fusel oil can be converted in a similar manner to that indicated in the case of butyl alcohol into isoprene, but the process would appear to be somewhat costly in operation. A similar process of chlorination with subsequent dechlorination has been proposed, utilising isopentane derived from American petroleum as raw material. It would appear possible that the hexane and pentane fractions of petroleum and shale oil may ultimately be utilised as a raw material for the synthesis of isoprene and its homologues, since the materials are obtainable in large quantities, of reasonable purity and of low cost.

Ostromisslenski has proposed an alternative method of preparation of isoprene from the saturated hydrocarbons to the chlorination process cited above, which, if capable of development on a large scale, should prove more economical. It is well known that in the cracking of petroleum to the lower boiling-point solvents and petrols, usually accomplished by the application of pressure and temperatures of about 500° C., unsaturated hydrocarbons are formed in appreciable quantities, consisting of mono, di and tri olefines, which impart to cracked petrols their disagreeable odour, yellow colour, and propensity for "gumming up" the inlet valves of petrol motors, their objectionable properties increasing with the degree of unsaturation of the hydrocarbon.

This process of dehydrogenation, which is probably reversible in character, occurs all the more readily in the presence of catalytic materials; thus at temperatures ranging from 300° to 400° C. pentane can undergo practically complete decomposition in the presence of reduced finely divided nickel. Cobalt and iron exhibit similar catalytic activity.

Ostromisslenski has shown that dipentene may be produced in considerable quantities by the dehydrogenation of n-pentane or by the elimination of methane, with subsequent dehydrogenation of n-hexane, thus making both hydrocarbons suitable as raw materials. When heated to 500° C.

dipentene gives appreciable quantities of isoprene and dimethyl divinyl. These reactions may be tabulated according to the following scheme:—



The data available as to the yields actually obtainable by this process are somewhat conflicting, but, as in most pyrogenetic operations of this character they are somewhat disappointing, it is to be hoped that by the proper study of the equilibrium conditions obtaining among the reactants at various temperatures the optimum conditions for operation in the presence of suitable catalytic materials will be discovered, making the process technically feasible.

Thus far we have discussed the various methods of preparing butadienes which offer some hope of realisation on a manufacturing scale; the second part of the operation involves the polymerisation of the butadiene to rubber.

We have already noted that Greville Williams effected the polymerisation of isoprene to rubber by continued exposure to light and air. The catalytic effect of light, especially ultraviolet light, was noted by Lebedev, Koch, and Collie, but the rate of polymerisation, even under the most favourable conditions of illumination, was exceedingly slow. Bouchardat observed the catalytic activity of hydrochloric acid, Tilden of nitrosyl chloride, Harries of acetic acid, and Kondakow of alcoholic potash; but with all these various agencies several days were necessary to ensure conversion.

The problem of the rapid polymerisation of isoprene and its homologues was not finally solved until 1910, when Hoffmann and Coutelle showed that pure isoprene or its homologues rapidly polymerised when slightly warmed, either in the presence of or without catalytic agents such as metallic aluminium, and that the rate of polymerisation was greatly lessened by the presence of impurities, such as hydrocarbons. Matthews a short time later showed that metallic sodium was an admirable catalytic agent, butadiene being polymerised to rubber in a few hours at ordinary temperatures. Sodium condensed caoutchouc has, according to Harries, a different structure to that obtained by the normal condensation process, but possesses similar physical characteristics.

The possible competition of a synthetic process rubber with the natural product does not, however, rest entirely with the successful economic development of one of the processes outlined above, since natural rubber by no means consists entirely of condensed isoprene. How far the natural resins of the plantation rubber assist in the preservation, and the small quantities of nitrogenous protein material in the vulcanisation of rubber articles, yet remains to be discovered. According to accounts, the German synthetic material provided a good substitute for hard rubber products, but was found entirely unsuitable for soft and elastic materials.

A New Zealand Inquiry

We are informed that Messrs. W. J. Meek, Ltd., of Dunedin, New Zealand, are anxious to obtain supplies of exicated sulphate of iron, for use in combination with phosphate of lime and other natural deposits as fertilizers. There are very rich natural deposits in New Zealand, and the firm are anxious to obtain from British sources the exicated sulphate of iron which was formerly obtained from Germany. We learn from the same source that American chemical manufacturers are at present giving great attention to our Colonial markets.

Organisation of an Industrial Laboratory

By A. D. Little and H. E. Howe

During the war industrial research in the United States was naturally stimulated, with the result that a deeper interest exists in the applications of science to manufacturing processes. New laboratories will undoubtedly be built and many old ones reorganised, and it is desirable that British business houses should understand what United States manufacturers are doing. The authors of this paper, which was presented to the spring meeting of the American Society of Mechanical Engineers, outline the aims of a research organisation and enumerate the divisions of the laboratory. The methods of management, writing of reports and the commercial organisation of the laboratory are discussed, and the paper concludes with a description of the building and equipment best suited for this type of work.

PREVIOUS to the war there were about 375 industrial research laboratories in the United States, including those maintained by manufacturers for their own benefit, and commercial laboratories prepared to render similar service. At the present time there are no figures available regarding the number of new laboratories established as a result of the war, but there is no doubt but that the war created a deeper interest in industrial research and the application of science to manufacturing processes. It is also evident that those laboratories which existed before the war are displaying a greater interest in fundamental research, and in rehabilitating their organisations are paying far more attention to the research phases of their problems than they have been willing to do heretofore.

In discussing the industrial laboratory we may choose between the one organised for the purpose of exploring some small corner of the broad field symbolic of our ignorance and an establishment concerned with the greatest variety of problems. A laboratory of the latter type should consist of a collection of special laboratories carefully articulated to produce results most efficiently, and the work common to all of them should be organised separately in a large general laboratory. Fortunately for our country there are several such laboratories doing splendid work, and, notwithstanding the care exercised to avoid undue specialisation, nearly all of them contain departments which dominate, due either to stronger men or the greater appeal which these departments make to the company; or perhaps to a seemingly greater importance of their class of problems at the moment. The great majority of these laboratories are maintained in the plants of industry at an annual expense running up to two millions in at least one case, and with many spending hundreds of thousands each year.

Another plan which should be mentioned involves the training of men as a primary consideration, and the Mellon Institute, at Pittsburgh, affords a conspicuously successful example of what may be done in educational institutions in solving the problems of industry, while at the same time men are trained in research.

The Aims of a Research Organisation

Broadly stated, the aims of a research organisation should be:—To find, develop, and train men; to create such a background in the public mind as shall insure support for research and the industrial utilisation of research results; to secure co-operation between different branches of science, as, for example, between chemists and mathematicians; to avoid repetition and duplication of effort, first by rendering present knowledge readily available to research workers, second by applying clearing-house methods to research projects; to stimulate research by emphasising the importance of specific problems, making special grants, rendering material and facilities as generally available as possible; to furnish a general staff for research which shall work out the plan of attack for major problems, assign the several lines to competent workers, and co-ordinate and focus the whole; to bring home to manufacturers the advantages of research, with the view of promoting the establishment of private, corporation, and group laboratories; to make and publish a census of available research facilities in men and equipment; to survey

the natural resources of the nation and direct research toward their development; to appraise our great industrial wastes, and develop plans and methods for turning them to profitable use.

As regards any research laboratory, it goes without saying that it is the personal factor which determines performance, and this is pre-eminently true of the laboratory director. Sir Humphrey Davy truly said that his greatest discovery was Michael Faraday, and no greater problem is likely to confront a research laboratory than that involved in the discovery of a director. Successful laboratory directors may be of several types, but a militant optimism, contagious enthusiasm, controlled imagination, and quick human sympathy are common to them all. Such a man will naturally, in selecting his subordinates, look for these personal qualities almost as carefully as he will weigh specialised scientific training, and having been thus guided in his selections will find it relatively easy to inspire throughout his organisation those relations of good fellowship and that *esprit de corps* which multiply enormously the effectiveness of any working force.

The so-called commercial laboratory, devoting its efforts to industrial research and operated on a strictly business basis, will best serve our present purpose, and that of Mr. Arthur D. Little, Cambridge, Mass., will be taken as a type, in the belief that much of interest will be found in this establishment, which is "dedicated to industrial progress." During the past thirty-three years this laboratory has grown from a partnership of two chemists to an organisation of sixty people, and scheme after scheme has been devised for the management of the enterprise, only to find new conditions and rapid growth calling for constant revision.

The Divisions of the Laboratory

Within such a laboratory there are two distinct sets of duties, which may be designated as scientific or technical, and commercial or financial. These two divisions have at least two points in contact, one being through a service manager, and the other the department charged with obtaining new business for the organisation.

The fundamental duty of the scientific division is to interpret the results of pure science in the terms of industry. While the work of the commercial laboratory is of the same order as that done in any laboratory, even where the dollar is never discussed, it must be conducted with full recognition of the fact that many industrial problems are as intimately concerned with economic questions as with scientific. In other words, while, for instance, a laboratory process in glass may be intensely interesting and of fundamental importance, the client can hardly be expected to be satisfied with a report unless a commercial method for operating it can be devised. The technical work should be in charge of the president, under whom various departments should be organised, so that each phase of a given problem may have the attention of a specialist, provided with adequate equipment to facilitate the work.

In this connection it may be emphasised that it pays to provide congenial, inspiring surroundings for the laboratory worker. The laboratory can be made attractive without being ornate, or involving unreasonable expense, and every effort

should be made to have the workers reasonably happy. Under no other condition can the best work be expected, and it must be remembered that the heaviest investment is in the time of these workers, the salary cost being much greater than that for equipment or material maintenance. Rewards other than monetary for faithful service also play an important part.

The departments into which the technical division are divided will naturally differ in each laboratory, but a fairly definite line can be drawn between research, engineering and standardised or routine work. It is advantageous to have all of the standardised work, including that incident to research and engineering, carried on under one department head, for in this way it can be done to better advantage, both as regards efficiency and economy.

The research department should be organised for both laboratory and small-factory-scale work. There will be a multiplicity of subjects, and since special facilities cannot be provided in advance of close acquaintance with the problem, the organisation of departments for research along special lines will concern personnel more than a division of floor space or equipment.

Engineering will embody plant inspection, design, construction, and operation, and although much of its work will be in the field, many phases of its problems will be worked upon concurrently in the laboratory.

The analytical department will be subdivided under such headings as textiles, fuels, food, metallurgy and metallography, chemical microscopy, water, lubricants, construction materials, pulp and paper, fermentology, &c. Some of these subjects will require special accommodations, while others can share a large laboratory which provides space for certain apparatus kept in place for a large number of similar determinations.

Nothing is more expensive or demoralising than experimentation in the plant. An industrial research laboratory should therefore be adequately provided with equipment of semi-commercial size. Infant mortality among processes is high in any case, and the most critical period in their young lives is that covering the transition from the laboratory to the plant. They require, and the research laboratory should provide, a nursery to protect and foster them during this period of their development. Some large manufacturers have even found it desirable to operate in connection with, and under the sole direction of, their research laboratory a small plant in which actual commercial manufacture is regularly conducted. Such extension of the laboratory's function permits the complete reduction to practice of new methods and the commercial demonstration of the sufficiency of the product before the innovations are introduced into the main plant.

Even when no such provision appears feasible, it is, nevertheless, highly desirable to have the industrial research laboratory actually engaged in some small scale, highly specialised commercial manufacture, preferably of some product which it has itself originated. The least advantage of this procedure is that such manufacture of a properly selected product may frequently defray a substantial proportion of the expenses of the laboratory. The major benefits are the acquirement of a certain commercial sense by the laboratory staff, an appreciation of the conditions and difficulties of actual production, and finally the strengthening of the position of the laboratory through the increase in its turnover and equipment.

The Method of Management

It is easy to visualise the organisation chart for such a laboratory, and a brief description of how a new piece of work will be handled may therefore convey a better idea of the method of management. The authorisation for the work will go to the service manager, who sees all incoming mails, and to the authorisation will be attached any correspondence or data bearing on the case, all of which will be given a case number for identification, and this number will be entered

in a case register, which will indicate the name of the client, the subject of the problem, the date the authorisation is received, and the date when the work shall have been completed. The service manager, who must be familiar with the ability of each member of the staff, as well as with the work in hand, will assign the case to the division which can render the best service. Conferences will then be called, into which any member of the organisation who can contribute anything to the solution of the problem in hand will be drawn, and outside associates or independent consultants may be included. The problem will then go into work by means of instruction sheets, setting forth what is to be accomplished, suggesting methods of attack, relating any special circumstances, references to literature, and standard methods which may be applicable, and as much light as possible given to the individual who is to do the work. Accompanying the case there will be a tag bearing the case number, and upon it a date at which it is expected the work can be completed, or a progress report made, must be indicated. The tag is then returned to the service manager. Through the means of data sheets, time slips, and verbal reports, the progress of the problem will be readily followed. This procedure will be followed in all the divisions, the individual reporting to his superior, and the service manager will be alert to insure prompt and efficient service to all clients.

At the completion of the work the report, varying in extent from a single printed form to a bound volume of several hundred pages, will pass through the hands of all concerned, and will thus be distinctly the report of the organisation and not of an individual in the organisation.

Reports

Writing a report requires skill, for it must be comprehensive. It should begin with a clear statement of the problem, followed by the conclusion reached as a result of the work, which may then be described in detail. Patents, costs, data, tables, graphs, photographs and samples should be dealt with in an appendix, and in some instances descriptions of apparatus should be included. The whole must be carefully indexed, and a copy sent to the library to be bound and kept as confidential information in locked cases, but as part of the library it should be carded for the library card index. Obviously no fast rule can be laid down for writing reports, but it should be borne in mind that many of those who read technical reports are not interested in minute details, and that the subject matter must be presented in a form that will be interesting and understood by the layman. It must also have its important points so emphasised that they can be readily picked out by those not caring to read the entire report, but at the same time it should include sufficient data to serve the purpose of a fully qualified technical man to whom the report may be referred at some later time.

This brings up the question of the library, which may easily be considered the backbone of the industrial laboratory. Its extent will depend upon other library material available in the community, but there are few things which obstruct research more seriously than the absence of easily accessible proper library facilities. A few dollars spent in books and literature frequently saves as many hundreds otherwise spent in work of duplication. The useful periodicals must be provided, elaborate indexes will be found a good investment, also abstracts and patents; in short, every means for quickly locating literature references should be at hand. The current literature, with articles of interest indicated on an attached slip, should be circulated among the members of the staff, whose names are checked on this slip, and someone, preferably a chemist, should have assigned to him the task of constantly reading the literature in order that no scrap of information shall escape. Such a chemist-librarian will conduct searches in other libraries, prepare abstracts, and in fact direct the information service for the laboratory, and through the laboratory to its clients.

Buildings and Equipment

With this general plan of management before us we may now consider the equipment and space required for effective work. Experience has shown that a satisfactory building is one approximately 50 feet by 150 feet (planned so that another building may be easily connected in H-formation), and consisting of a basement, with three floors, the basement itself being so designed that it is as light and airy as the upper floors. Such a building, with a wing housing the power plant and small grinding rooms (this being the connected wing of the H) has a total floor space of approximately 30,000 sq. ft. The building occupied by Arthur D. Little, Inc., is of this type, and the various departments are allotted the following space:—Analytical division, 5,328 sq. ft.; research division, 3,458 sq. ft.; engineering, 1,155 sq. ft.; commercial department, 768 sq. ft.; management (meaning the management of outside enterprises), 538 sq. ft.; special department devoted to pulp and paper, 4,118 sq. ft. The portions of the building which are non-producing, such as miscellaneous offices, which includes stairs, corridors, halls, lavatories, etc., comprise 8,000 sq. ft., and the space unassigned amounts to 3,815 sq. ft. This includes laboratory space provided for emergencies and expansion, but not in constant use.

The basement will provide room for the power plant, the current sample room, the general stock room, two very large rooms for small-factory-scale equipment, two small rooms for coal and other crushing and grinding operations, and a machine shop in which the physical testing machinery can be installed. A laboratory for testing construction materials, such as cement, may also be placed in the basement to advantage; and here, too, a room and vault can be set aside for inactive letter files and records.

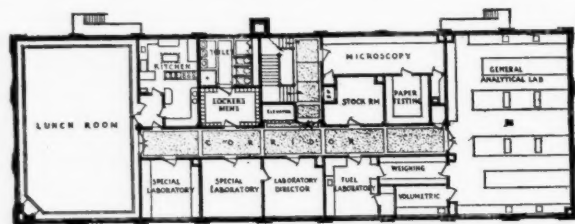
The first floor will provide a series of offices, each of about 250 sq. ft. area, two larger ones which may be used by officers of the company, consulting engineers and others, a reception room, and an information booth with switchboard. The museum can also be on the first floor, together with the rooms devoted to the commercial department's work. Quarters for the financial division, with ample vault space, and room for current correspondence and the general stenographers' office, complete the floor. The engineering division might also occupy rooms on the first floor.

The second floor may be properly devoted to research and the library. It is frequently advantageous to be able to segregate research problems, and it will be well to provide a series of small rooms, say of approximately 250 sq. ft. in area, which can be fitted up in accordance with the requirements of the problem, and easily dismantled at the conclusion of the work, to be refitted according to the next undertaking. A branch stock room should be located on the second as well as the third floor, and these should be served by elevator from the general storeroom in the basement. There are always a number of scattering problems in research that can be handled in one laboratory, and so a special-problems laboratory should also be provided on the second floor with an office for consultation purposes. Finally a large room, say of 1,500 sq. ft., should also be available for large undertakings, and as a space for emergency overflow.

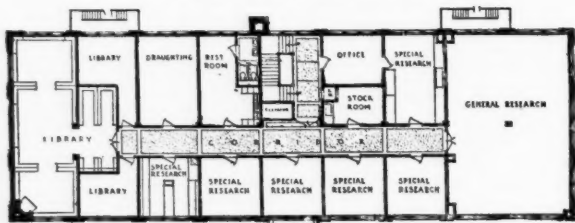
The third floor may comprise the general analytical laboratory, a room of about 1,500 sq. ft., adjacent to which should be a room for titration and the balance room (each of approximately 125 sq. ft.), a fuel-testing room, and a special room for extraction. A branch stockroom and the offices of the head chemist and assistants should also be on this floor. The optical room should be placed where north light can be obtained, and a small dark room must be provided, as well as a specially equipped room for the physical testing of paper and textiles. The kitchen can adjoin the assembly room. A locker-room for the men and a rest-

room for the women must also be provided. Space under the roof can be used for fans and a ventilating appliance, water-tanks, etc.

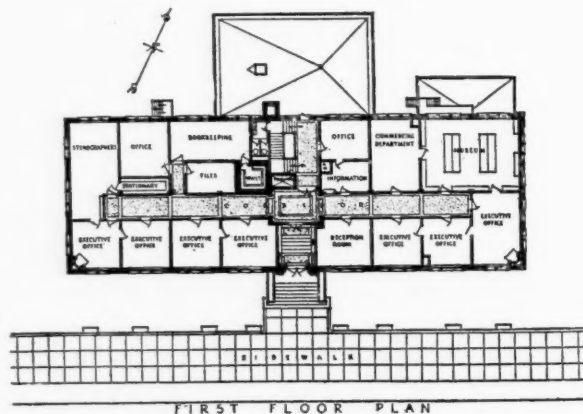
Such a building, as has been thus briefly described, will cost about \$200,000, and \$50,000 will provide general equip-



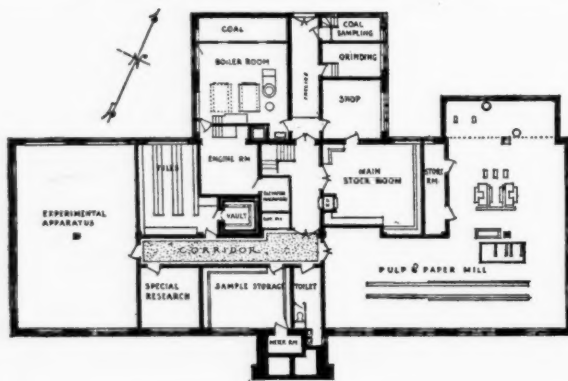
THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT PLAN

ment. Such an establishment will provide working space for approximately 150 people, and more could be accommodated if necessary, depending largely on the type of work being conducted. The cost of operation and maintenance, based on a staff of sixty, will be about \$20,000 per month.

Safeguarding British "Key" Industries

Import Restrictions on Chemicals

WITH reference to the Prime Minister's statement in Parliament on Aug. 18, on the subject of trade policy the Board of Trade make the following announcement as to the steps which are proposed in connection with imports of goods from abroad.

Legislation will be introduced when Parliament reassembles (a) for the protection of goods manufactured in Great Britain and Ireland against dumping by taking power to prevent the sale in this country of similar goods beneath their price in the country of origin; (b) to enable the Board of Trade to check any flood of imports (for instance from Germany) that might arise from a collapse of exchange so disproportionate to costs of production in the country of origin as to enable sales to take place in this country at prices altogether below costs of production here; (c) to deal with unstable "Key" Industries in the following way:—

A limited number of unstable "Key" Industries will be scheduled, the products of which will be prohibited from importation into this country except on licence. Pending legislation, a general licence under the Prohibition of Import Proclamations will be issued by the Board of Trade, having effect as from Sept. 1, 1919, and authorising the importation into the United Kingdom of all goods with the exception of those in the following list, which will be treated as unstable "Key" Industries:—

- (1) (i.) All derivatives of coal tar generally known as intermediate products, capable of being used or adopted for use as dyestuffs or of being modified or further manufactured into dyestuffs. All direct cotton colours, all union colours, all acid colours, all chrome and mordant colours, all alizarine colours, all basic colours, all sulphide colours, all vat colours (including synthetic indigo), all oil, spirit and wax colours, all lake colours, and any other synthetic colour, dyes, stains, colour acids, colour lakes, leuco acids, leuco bases, whether in paste, powder, solution or any other form.
- (2) (i.) Synthetic drugs (including antiseptics).
- (ii) Synthetic perfumes and flavourings, synthetic photographic chemicals, synthetic tannins, esters and acid derivatives of aromatic hydro-carbons, alkaloids and their salts (except quinine), and the following organic chemicals: acetamide, acetic acid, acetic anhydride, acetyl chloride, camphor bromide, cinnamic acid, and its salts, ethylene bromide, formamide, formic acid and its salts, gallic acid, lactic acid and its salts, nuclein, paraldehyde, pyrogallol, saccharine or other substances of like nature or use, salicin, thymol.
- (iii.) Analytical re-agents, and the following fine chemicals: barium compounds, cerium fluoride and fluorides of other earth metals, hydrosulphites and allied bleaching compounds; hypophosphorus acids, iron and ammonium citrate, iron tartrate, molybdic acid and its salts, phosphorous oxides and halogen compounds, salts of per acids and artificial peroxides, silver nucleinate and proteinate, tungstic acid and its salts.
- (3) Optical glass including lenses, prisms and like optical devices.
- (4) Scientific glassware.
- (5) Illuminating glassware.
- (6) Laboratory porcelain.
- (7) Scientific and optical instruments.
- (8) Potassium compounds.
- (9) Tungsten powder and ferro-tungsten.
- (10) Zinc oxide.
- (11) Lithopone.
- (12) Thorium nitrate.
- (13) Gas mantles and mantle rings.
- (14) Magnetos.

In addition to the above, in pursuance of the undertaking given by the President of the Board of Agriculture in the House of Lords on March 19, 1919, the prohibition on the importation of hops will be continued for the present.

It is not proposed to make any addition to the above list unless and until Parliament so determine, with the possible exception that in the event of the contingency foreshadowed

in paragraph (b) above arising, it might be necessary to suspend temporarily all or any of the imports from the country affected by the collapse of exchange.

Imports of Oils

In view of misapprehensions the Board of Trade make the further announcement that pending legislation a general licence under the Prohibition of Import Proclamations is to be issued to cover all goods with the exception of those set out in the list of key industries. In the case of kerosene and benzine (including white spirit), gas oil and fuel oil, this general licence refers to total quantity of import and does not affect the agreement entered into by the Government to limit the number of importing firms for the period of the existence of the Pool Board, and nine months thereafter to those firms which co-operated with the Government to form the Pool Board as a result of which the community received material benefits.

The termination of the war organisation of the Pool Board as from January 31, 1919, was announced on January 2, 1919. The nine months period which has to elapse before other firms are allowed to import does not therefore expire until October 31, 1919.

Further, it should be noted that in accordance with the provisions of article 295 of the Treaty, which requires all the parties to the Treaty to adopt the International Opium Convention, the importation of opium and cocaine, except under Home Office licence, remains prohibited.

"The Chemical Age"

At the annual meeting of Benn Bros., Ltd., publishers of THE CHEMICAL AGE, and other trade and technical journals, Sir John Benn (Chairman), in moving the adoption of the report, said that all their journals during the year had published issues which, measured by size, circulation, or advertisements, had beaten every record. In the last few months two new journals had been started. The first of these, a weekly review of industry and social progress, had been aptly described as "The organ of the new spirit in industry." *Ways and Means* was to some extent the outcome of the public work which had been done by the Managing Director in connection with the Whitley Report, and after some seventeen weeks' publication it was already possible to pronounce it a marked success. The enormous impetus which had been given to the chemical industry during the last few years, due to the cutting off of supplies from Germany, quite obviously needed the assistance of a technical paper to help it through the critical days that were coming. THE CHEMICAL AGE had been received with open arms by the progressive side of the chemical industry, and the directors looked to it as one of their most important ventures. The meeting approved the declaration of a dividend upon the Ordinary share capital of the Company at the rate of 15 per cent. per annum, less income tax.

Vegetable Oil Extraction

MR. A. N. LUBBOCK, presiding on Tuesday at the meeting of the British Vegetable Oil Extraction Corporation, Ltd., said that up to the end of March of the current year they were working under strong Government control. Directly control was released the price of produce, both raw and finished articles, went up tremendously, with the result that the Government was now exercising control again in another form. That was to say, the trade was voluntarily controlling itself under the supervision of the Ministry of Food. The Board had had a balance-sheet made up to June 30 last, which showed that, at that date, there had been a loss of £80,330. Last week they received from the Government £3,900, which was owing to the Corporation, and the loss therefore at its worst point might be looked upon as £76,430. Since the end of May last losses had ceased, and the profit stage had not only begun, but was making steady progress. It would be necessary to rearrange their finances before the end of this year, and he hoped that, when doing that, they would be able to come to an arrangement with the Deferred shareholders whereby they could convert those shares into some other form of share. He hoped to meet the shareholders next year with a much more satisfactory statement of accounts, and he would be much surprised if 1920 did not show a considerable further improvement.

British Nitrogen Products

Still Awaiting the Report of the Committee

THE delay in issuing the report of the Nitrogen Products Committee was the subject of a leading article in the *Times* on Monday. The report, it states, of the Committee, appointed in June, 1916, which was ready last May, is still unpublished. The terms of reference were wide, and doubtless the report is a voluminous document; but, even so, the suggestion that the delay in its publication is due to the time required for the preparation of an index seems unconvincing. The Committee carried out much experimental work on the production of ammonia by the direct union of hydrogen and nitrogen on the Haber method. The general principles of this method are well known, but the all-important technical details were a German secret. The Committee are believed to have attained results which are in some respects better than the German practice. We understand that the report recommends the establishment of a plant on a commercial scale, as the experimental apparatus at University College, where the investigations were conducted, was only on a laboratory scale. The nitrogen of the air can also be "fixed" on a commercial scale by the calcium cyanamide process, for which cheap electric power is required. Water power in Scotland would be the convenient source, but, were this not available, a steam plant is required to gain experience and to form the nucleus of a manufacture that could be expanded.

Fixed nitrogen is necessary equally for the high explosives of war and for the fertilisers of peace. The quantities supplied from gasworks and coke ovens have not sufficed, and have for long been supplemented by large importations of Chile nitrates. The Germans, who themselves had been large importers from Chile, recognised the importance of the supply to Great Britain, and their submarines paid special attention to ships bringing saltpetre from South America. Germany had prepared for the emergencies of war by gaining control over much of the cheap Scandinavian water power. During the war she developed the Haber process within her own confines. It has even been suggested that she delayed "The Day" until her production of nitrates was on a satisfactory basis. Now that the war is over, her production of nitrates, like many of her other manufactures of war material, has been swiftly transformed to commercial purposes. We were able to state a few days ago that Germany has built one huge ammonia factory since the Armistice, and there is reason to believe that her chemists have succeeded in producing ammonia in the more valuable form of synthetic urea. The advantage of this advance in the commercial application of laboratory experiment is that urea is more concentrated as a fertiliser than sulphate of ammonia, and is cheaper to produce, as it is made with carbonic acid instead of sulphuric acid. So far Great Britain has done little except to produce reports. Early last year the Government began the erection of an ammonia factory at Billingham-on-Tees, but this was not given precedence over schemes like the motor works at Slough, and is still a long way from completion.

Future of the Government Factory

Referring to the statement that nothing has been heard as to the future of the large Government factory on the Tees which was started last year for the fixation of atmospheric nitrogen by the synthetic ammonia process, a correspondent of the *Manchester Guardian* states that the last announcement made to the public was Mr. Churchill's statement, early in 1918, that the Ministry of Munitions was undertaking this process. At the time of the Armistice the factory was still being constructed. "A million of money has been sunk," it is stated, "but the work was stopped. Apparently the whole scheme has been treated as a war loss."

This, I am informed, is not the case. At the Armistice the problem arose of what should be done with the factory—should the Government run it as a national enterprise, or should it be handed over to private enterprise? This question will shortly be decided by the Cabinet but Lord Inverforth is about to complete important negotiations which, if the Cabinet agree, will result in the whole undertaking being handed over to an association of all the trade interests concerned.

This is an exceedingly powerful and wealthy combination of explosive and chemical manufacturers. The arrangement proposed is that this concern shall relieve the Government of all liability for the undertaking, but at the same time it will be stipulated that the Government shall have the right to have the first call upon the output of nitrates in the event of any national emergency.

No Monopoly of Research

Another vital point is that the whole of the great mass of scientific information which has been collected, and on which the new process is based, is not to be the monopoly of the trade combination that is to run the factory. The Government has insisted that it is to be at the disposal of any firm with sufficient standing and resources that can show that it is in a position to work the process.

No monopoly is to be allowed in the utilisation of the researches of the Nitrogen Products Committee. Some of the foremost scientists in the country sat on this Committee, and worked out the solution of the problem of the home production of nitrates—matter, of course, essential in the production of munitions and with vast possibilities in agriculture in time of peace.

A point was made of the fact that the fruit of the Committee's researches has not yet been published. I understand the official view to be that it is inadvisable to publish the details of the process until matters are so far advanced that manufacture has begun in this country. There are interests abroad that would be only too pleased by premature publication here.

If the scheme comes off, the Ministry considers that a very good stroke of business will have been done for the nation, and that the loss, if any, will be slight. Instead of the factory being scrapped, which has been the fate of some war undertakings, there is now the prospect of it being used for the purpose for which it was intended, and of developing into an important new industry. It will prevent our being entirely dependent for nitrates upon Chili.

Scottish Shale Oil Position

THE mineral oil trade in Scotland is passing through a period of crisis. During the war the greater use of oil for motive power kept the industry going steadily, but with the limitation of that demand, and with the claim of the shale miners for a seven hours' day following upon increased wages to bring them into line with other miners, the companies were faced with a serious situation. They stated that the works could not be carried on financially if the concessions demanded were made, and declared that the alternative was to close the mines and utilise their refining plant for dealing with imported crude oil.

It would appear that this latter project is on the way to fulfilment, for the Anglo-Persian Oil Company have offered to form a new company, with a capital of £4,000,000, to acquire Pumpherston oil works, Broxburn oil works, Oakbank oil works, Young's oil works, and those of James Ross & Co., all situated in the West Lothian shale field. Steps are now being taken to form the new company. Meantime the shale miners are pressing their demands, and a ballot is to be taken on the question of a complete stoppage to enforce their claims. The men's officials say that they must have something more substantial than any employer's word on the question of ability to pay an increase resulting from the shorter day, and they want access to the employers' books by an accountant on their behalf. They want evidence for the employers' statement that they would be in the Bankruptcy Court if the men's claims were met, though the miners recognise that the position has become involved by the offer of the Anglo-Persian Oil Company to buy up the Scottish companies. Their Executive have advised them not to give way, but to strike.

Pottery from Coal-mine Clay

A COLLECTION of stoneware pottery, including a pattern of an old-fashioned Toby jug and various types of other ware, such as dishes, bottles, and jars, which has been manufactured from clay extracted from an underground coal mine seam in the Lancashire coalfield, is at present on exhibition at Wigan. The clay from which the pottery has been made is found under the Mountain Mine coal at Upholland, near Wigan, a seam which is only about 2 ft. thick, but of good quality, and the clay is mined along with the coal. Mr. Alfred Allen, a member of the Upholland District Council, who has for a number of years worked the Mountain Mine Colliery, is so sanguine of the commercial possibilities of this clay that he has drawn the attention of the Wigan Corporation Industries Committee to the great possibilities of utilising it in the manufacture of stoneware pottery, and of thus introducing a new local industry.

German Potash for British Farmers

Board of Trade Distribution Scheme

THE Government has recently acquired from Germany a quantity of potash salts in exchange for food, and arrangements have now been made by the Board of Trade, in conjunction with the Board of Agriculture, for the distribution of about 40,000 tons for agricultural purposes. The sale of the material will be undertaken by the British Potash Company, Ltd., 49, Queen Victoria Street, London, E.C. 4, under the direction of an official committee, to be called the Potash Distribution Committee, on which the Board of Trade and the Departments of Agriculture for England, Scotland and Ireland will be represented, together with representatives of trade interests.

The following maximum selling prices have been agreed: For sales to farmers delivered to nearest railway station in Great Britain or Ireland, in lots of not less than four tons—potash salts, 30 per cent. K_2O , £12 10s.; muriate of potash, 80 per cent. KCL, £20 12s. 6d.; sulphate of potash, 90 per cent. K_2SO_4 , £23 2s. 6d.; all per ton net cash in bags. Manure mixers, merchants, dealers and co-operative societies will be allowed a discount on these prices of 7s. 6d. per ton on potash salts and 10s. per ton on the muriate and sulphate of potash. The potash will be sold at the above basis prices, and a proportionate increase or decrease will be made for higher or lower quality as shown by analysis of a representative sample of each consignment.

Farmers should place their orders without delay with their usual dealer or co-operative society. Manure mixers, merchants, dealers and co-operative societies should send their orders to the British Potash Company, 49, Queen Victoria Street, London, E.C. 4. Special terms may be arranged for purchases ex-ship.

For sales of small quantities made ex merchants' store the Board would regard as reasonable the following maximum additions to the price charged for four-ton lots:—

Quantity delivered.	Additional price.
1 ton and over	10s. per ton
2 cwt. and over, but less than 1 ton ..	1s. per cwt.
1 cwt. and over, but less than 2 cwt. ..	2s. per cwt.
28 lb. and over, but less than 1 cwt. ..	3s. per cwt.
14 lb. and over, but less than 28 lb. ..	4s. per cwt.

No potash of a lower grade than 30 per cent. salts is available under the above arrangement, but licences are being granted to the Alsace-Lorraine Trading and Development Company, 54, Gresham Street, London, E.C. 2, for the importation of 20,000 tons in all of kainit (14 per cent. K_2O) and sylvinit (20 per cent. K_2O).

The Secretary of the British Potash Co. states that the times and places for the sale of German potash have not yet been fixed. The arrangements for the transit of the potash are being energetically pushed forward, and the shipments are confidently expected within the next two or three weeks. The material will then be disposed of in various parts of the country, wherever there is a desire shown to take advantage of it. The company anticipates a big demand from farmers and others who recognise the value of potash salts as a fertilizer.

German Company's Earnings

About one-sixth of the capital stock of 40,800,000 marks was represented at the annual meeting of the German Potash Works at Bernterode. Last year's profits amounted to about 4,500,000 marks. The stockholders will get 7 per cent. Business during the first three months of the present year was very bad, but it improved in May and June.

The Potash Works Neustassfurt cleared more than 1,500,000 marks last year, but some of the other concerns have not paid any dividends at all for several years, such as Niedersachsen in Wathlingen, Belenrode, and Hanover. Nearly all the works were closed more than once since last November, as a result of labour and political troubles. Stockholders are clamouring for higher prices, which were raised only last April, but the Government is afraid of offending the farmers who would have to pay the higher price, since foreign countries have ceased buying German potash.

The stockholders of the Thueringen Works at Heygendorf decided to liquidate the business, in case the labourers insist upon higher wages. Since then a scale of wages has been agreed upon between the labour unions and the representatives of twenty-one works of the Bernburg, Aschersleben, Stassfurt,

Westeregeln and Brunswick districts. Minimum wages per shift will be 15 marks. However, this increase will depend on an increase in price.

The Alsatian mine St. Therese has been converted into a French stock company. The capital will be 10,000,000 francs, instead of 8,000,000 marks. The company decided to issue bonds to the amount of 20,000,000 francs. A syndicate of French banks has agreed to take the bonds.

The German potash syndicate has reached a new price agreement with the Dutch import organisation. About 50,000 tons are now being shipped to Holland. The amount is to be increased later.

Nebraska Potash all Sold

We learn from *Drug and Chemical Markets* that H. J. Baker & Brothers, New York, have sold for account of the producer and consumer all the Nebraska potash in the market, amounting to about 30,000 tons. The transaction is of special interest, because imports of European potash are just arriving in the United States. It is said to be one of the largest transactions in potash in recent years. The price at which the 30,000 tons were sold is not disclosed, but H. J. Baker & Brothers state that future sales of domestic and imported potash will be on a basis of \$2.50 per unit.

Alsatian Potash for U.S.A.

The second importation of Alsatian potash to be received in the United States since the war, reached Baltimore, Aug. 2, on the steamer "Caledonier" from Antwerp. The shipment consisted of 1,300 tons of kainit and 350 tons of muriate of potash for H. J. Baker & Brothers, to be distributed among local buyers by the Baltimore representative. Another shipment, amounting to more than 4,000 tons, is expected. The first import of this material to be received in Baltimore arrived some weeks ago, and consisted of 150 tons of potash for local buyers.

Sources of Power

SIR OLIVER LODGE's interesting speculations in the *Observer* as to the utilisation of atomic energy, end for practical purposes a little disappointingly. "I have dealt," he writes, "with the energy locked up in the atom of matter. The energy locked up in a corresponding volume of ether is immensely greater than that. A cubic foot of space, on our estimate, contains enough power to drive every engine and every furnace in the world for a century. Once such a source of energy as that is even partially tapped, nothing further in the way of mechanical resources will be needed. But how far away are we from being able to tap it? I see no clue at present. The energy of matter is just beginning to be accessible. The utilisation of any of the energy of ether, if ever it becomes accessible at all, must take years, perhaps centuries, of further study. But why attempt to prophesy whether it will ever be done? We simply do not know. The method of approach must be indirect, and along the avenue of pure science."

"For all practical purposes," he concludes, "for the present it will be best—

"1. To economise our fuel and all known molecular power, extracting from coal its valuable constituents and only burning the solid and gaseous residue.

"2. To try to discover methods of utilising the stored-up constitutional atomic energy of matter.

"3. To leave the ether for the present to the few enthusiasts who with no practical aim in view seek to meditate upon and explore its astounding properties."

Chemical Research Fellowship

IN May last the General Bakelite Co. established a research fellowship in the department of chemical engineering, Columbia University. The fellowship is for a year, beginning July 1, 1919, and the holder receives a stipend of \$1,000. The subject to be investigated is that of Phenolic Condensation Products, a subject in which the General Bakelite Company is very much interested. It is to be particularly noted, however, that the results of the researches are to be freely published as scientific contributions, and that the Bakelite Company will lay no special claim whatever to the results. The money is simply handed over to the University for research in the general field indicated, as the results will be as favourable for anyone as for the General Bakelite Company.

From Week to Week

SIR GLYNN WEST has been appointed vice-chairman of Sir W. G. Armstrong, Whitworth & Co.

MR. WILLIAM MOSLEY, of Glendarroch, Cheadle, head of the firm of William Mosley, Ltd., b'eachers, has left estate valued at £15,383.

THE LATE ALDERMAN, Joseph Hayhurst, of Bradford, Secretary of the Amalgamated Society of Dyers, has left estate valued at £2,241.

AS THE RESULT of a fire at the works of Messrs. S. Connor & Sons, Newry, Belfast, £10,000 worth of drugs, surgical instruments and supplies and other valuable property were destroyed.

MR. HOLBROOK GASKELL, of Erindale, Frodsham, Cheshire, director of the United Alkali Co., closely identified with the development of the chemical industry in the Widnes district, has left estate of the value of £328,824 (net personalty £325,222).

A NEW DYE recently announced by the U.S. National Aniline and Chemical Company, cotton blue B, is an acid blue that will especially interest the silk dyer, the paper manufacturer, and the ink maker. It is also expected to take the place of a blue for laundry purposes, formerly used.

THE SCOTTISH OIL COMPANY, LTD., will be the name of the new company formed by the taking over by the Anglo-Persian Oil Company of the Scottish oil companies. The capital will be £4,000,000, divided into 3,000,000 7 per cent. Preference shares and 1,000,000 Ordinary shares, each of £1.

WOOD DISTILLATION FACTORIES at Bideford, Coleford (Forest of Dean), Dundee, Longparish, Ludlow, and Mid-Lavant (near Chichester), the property of the Government, are being offered for sale by private treaty by the Disposal Board of the Ministry of Munitions. They are all accessible by railway.

WHILE A NUMBER OF WORKMEN were engaged at the Columbia Works of Joseph Thompson & Co., emery and bone cutters, Sheffield, a spark set fire to xylonite dust. The front of a large three-storey building became a mass of flames. All the employees escaped but one, Benjamin Wildsmith, who was burned to death.

WHILE AT WORK in a chemical manufactory at Barking Creek, a boy, fifteen years old, fell into a tank of boiling liquid and was so severely scalded that he died three hours later. In returning a verdict of "Accidental Death" the jury added the opinion that the platform on which the boy was standing was insufficiently guarded.

DURING LAST WEEK-END about forty members of the Hull Chemical and Engineering Society visited the works of Messrs. Rose, Downs & Thompson, Ltd., Cannon Street, Hull. They were received by Mr. James Downs, one of the principals and Mr. Bellwood, director, and were much interested in the works organisation and various processes.

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom for the week ended August 23, were 18, an increase of two. The numbers of bills of sale registered and re-registered was 127, an increase of 70. Mortgages and charges registered by limited companies amounted to £2,512,632, the amount authorized (where stated) being £149,750.

THE PRESIDENT OF THE BOARD OF TRADE has appointed Mr. W. J. Hands, O.B.E., to be Controller of the Profiteering Act Department. All communications in connection with the administration of the Act should be addressed to the Controller, Profiteering Act Department, 1, Queen Anne's Gate Buildings, Westminster, S.W. 1. (Telegraphic address: P. of act dep, Vic, London.)

THE HOME OFFICE COMMITTEE on Miners' Lamps gives notice that it is open to consider new suggestions for improving the safety or illuminating power of safety lamps, and to examine and, if necessary, test any new devices or new types of lamps that may be sent by inventors. Communications on the matter should be addressed to Mr. E. Fudge, secretary of the Committee, Home Office, Whitehall, S.W. 1.

THE WELSH TINPLATE AND METAL STAMPING CO., LTD., Llanelly, is being reconstructed, to enlarge the capital, by a voluntary winding-up and the incorporation of a new company with the same title. All liabilities will be duly discharged, and creditors paid in full, as ordinarily. Meantime, for liquidation

purposes, all creditors are requested to render any account due up to and including the 31st instant, promptly after that date.

IT IS ANNOUNCED that the Government have stopped the manufacture of cordite at the great munitions factory at Gretna-Carlisle. At full pressure, the Gretna works employed 20,000 people, and since the Armistice they have continued to manufacture cordite, the number of workers being returned a fortnight ago as 3,000. The works at Gretna are stated to have cost £9,000,000, and it is not clear what use is to be made of them for the future.

THE NINTH NUMBER of the *Journal of the British Science Guild* may be obtained (price 6d. per copy, postage 1½d.) on application to the Secretary, British Science Guild, 199, Piccadilly, W. 1. The Journal contains the report of the work of the Guild for 1918-19, various memoranda, and a report of the thirteenth annual meeting, with addresses by Major-General the Right Hon. J. E. B. Seely, D.S.O., M.P., Sir Joseph J. Thomson, O.M., P.R.S., and the Right Hon. Lord Sydenham, G.C.S.I., F.R.S., on "Science and Labour Unrest."

REPORTS FROM HELIUM PLANT NO. 3 AT PETROLIA, TEXAS, designed and built under the direction of the United States Bureau of Mines, show that production of helium began on April 1 and that the quality and quantity have steadily increased. The government officials in charge of this work are confident that very soon helium of the highest purity on large scale production will be forthcoming from this plant. The plant, which employs the Jeffries-Norton process, developed by the Bureau of Mines has a capacity of 30,000 cu. ft. of helium per day, and costs \$150,000.

A PROPOSAL of the James Watt Centenary Committee to make the centenary celebrations at Birmingham on September 16-18 next a means for helping modern James Watts through the establishment of a Research Institute, to discover new labour-saving machinery and methods, is being welcomed by engineering firms. Messrs. Vickers, W. & L. Avery, and the Birmingham Small Arms Company have each proffered £1,000 towards the required sum of £200,000, and Sir George Bean has offered £500. Small sums are also being received. New Zealand engineers have decided to join with all the other world engineers in sending representatives to the centenary celebrations.

THE UNITED STATES CONSUL at Leeds, in his official report, mentions a new process for the continuous distillation of tar as in successful operation in England. By a new process, the tar is distilled continuously, each fraction being given off in uniform quality, the pitch being discharged without cessation, both process and product being free from any noxious or disagreeable fumes. The plant works automatically, and the inventor states that it can be operated by an unskilled man after only one day's training. It can also be used, if desired, for producing prepared tar for dustless-road construction and tar-spraying, which comply completely with all the British Road Board's specifications.

PROPOSALS FOR THE NEW PREFERENTIAL RATES of Customs duties in favour of Empire products, as outlined in the last Budget, will operate except in the case of tea, as from September 1. The preferential rates are applicable to all goods subject to Customs duties which are shown to the satisfaction of the Commissioners of Customs and Excise to have been consigned from and grown, produced, or manufactured in the British Empire. The following come within the scope of preferential treatment, together with the preferential rates of duty:—Sugar, glucose, molasses and saccharine. On these the duty payable will be five-sixths of the full rate. Kinematograph films will pay two-thirds of the full rate.

AT THE INSTANCE of the Automobile Association, who received reports of the great dearth of motor fuel in Scotland and the Isle of Wight, the National Benzol Association have taken urgent steps to forward supplies to the affected areas. In addition, the Automobile Association has communicated with the Department which is winding up the Pool Board, pointing out the serious position in which many motorists are placed. Many motorists are delayed in Scotland, and although it is expected that the situation will be eased very shortly, there are so many cars awaiting supplies in order to leave that the dearth may be felt for a considerable period. Motorists contemplating tours should take sufficient fuel with them to last until they return to the north of England. Benzol is probably more easily obtainable in Scotland than petrol at the present moment.

The Indian Market

(FROM OUR OWN CORRESPONDENT.)

Increasing Demand for Agricultural Chemicals

INDIA is an agricultural country with a surveyed area of 619,520,804 acres, of which 85,079,169 acres are under forest. The area sown with crops shows:—Rice, 78,679,425 acres; wheat, 23,871,366 acres; barley, 8,012,987 acres; jawar, 23,050,921 acres; bajra, 14,343,377 acres; ragi, 4,338,380 acres; maize, 6,735,325 acres; gram, 13,558,533 acres; grains and pulse, 31,144,723 acres; fruits and vegetables, 8,307,725 acres; sugar, 2,550,608 acres; coffee, 91,003 acres; tea, 593,364 acres; linseed, 2,450,779 acres; sesamum, 4,135,086 acres; rape and mustard, 4,075,575 acres; other oilseeds, 3,574,149 acres; cotton, 11,435,135 acres; jute, 2,349,381 acres; other fibres, 787,351 acres; indigo, 351,265 acres; opium, 182,030 acres; tobacco, 1,027,038 acres; fodder crops, 7,076,258 acres, &c.

India is the largest cotton-producing country in the British Empire, and the second largest in the world. The average yield per acre of the Indian crop is only about 85 lb. of lint, whilst the United States crop is nearly 200 lb. per acre, and the Egyptian crop 450 lb. Improved agriculture in India is receiving attention, and agricultural chemicals of all varieties and for all purposes are in request.

Recent Indian Flotations

Among joint-stock companies recently registered under Indian laws are:—Diex Aye Rubber Co., Calcutta, rubber manufacturers, capital Rs. 200,000; Bilaspore Lime & Cement Co., Bengal, lime and cement manufacturers, Rs. 200,000; Assam Central Bricks & Tiles, Calcutta, lime and cement manufacturers, Rs. 200,000; Dooriah, Calcutta, indigo cultivators, Rs. 600,000; Express Oil Mills Co., Calcutta, oil manufacturers, Rs. 100,000; New Savan Sugar & Gur Refinery Co., Calcutta, manufacturers and refiners of sugar, molasses, saccharine, Rs. 1,500,000; Adhesives Manufacturing Co., Calcutta, manufacturing gum, glue, &c., Rs. 100,000; Hlaygadaung Concessions, Rangoon, miners, smelters, Rs. 300,000; Frank Ross & Co., Calcutta, chemists, Rs. 550,000; Buxa Forest By-Products, Calcutta, manufacturing tannin extracts, cutch, &c., Rs. 1,000,000; Assam Sugar Estates & Factories, Calcutta, manufacturers of sugar, molasses, &c., Rs. 3,000,000; Bihar Mica Concern, Calcutta, mica miners, Rs. 50,000; J. S. Mull & Co., Calcutta, dealers in minerals, Rs. 375,000; Calcutta Oil & Cake Mills Co., Calcutta, oil seeds, Rs. 500,000; Datta Chemical Works, Calcutta, manufacturers of bichromate of soda, Rs. 150,000.

These flotations afford an idea of industrial activity on the spot. British firms might well begin to consider the question of establishing factories in India.

Coal

Coal was produced in India in 1917 to the extent of 18,213,000 tons. Of this the railways consumed 31 per cent., or 5,620,000 tons; the Admiralty, 8 per cent., or 1,429,000 tons; jute mills, 5½ per cent.; cotton mills, 5 per cent.; iron and brass foundries, 4½ per cent.; inland steamers, 3 per cent.; brick and tile factories, 2 per cent.; cotton presses, tea gardens, flour and rice mills, port trusts, arsenals, paper mills, oil mills, 1 per cent. each; electric supply installations, tramway works, gold mines, sugar factories, water works, ½ per cent. each; petroleum factories, breweries and distilleries, gas works, ¼ per cent. each. Consumption of coal at collieries and wastage, 12 per cent., or 2,186,000 tons.

Indian railways are experimenting in the use of pulverised coal, which is of great interest in view of the character of some Indian coal.

Quinine

India is a good market for quinine. During November and December the imports totalled:—Quinine sulphate, 12,779 lb. (of this Java supplied 10,015 lb.); quinine hydrochloride, 464 lb. (of this Java supplied 301 lb.); quinine, 3,531 lb. (of this the United Kingdom supplied 3,084 lb.). Cinchona febrifuge is being sold in powder and 3½-grain tablet form—powder, 4 oz., 8 oz., and 16 oz., at Rs. 1.12, Rs. 3.5, and Rs. 6.8 respectively, and tablets, Rs. 2, Rs. 3.13, and Rs. 7.8 respectively.

American Enterprise in India

Among American chemicals being introduced are:—Caustic soda, soda ash, chloride of lime, carbon tetrachloride, bichromate

of soda, permanganate of potash, carbon bisulphide, fine chemicals, drugs and pharmaceuticals, aniline dyes, finest quality crystal alum, pure sulphate of alumina (all strengths), chemicals for paper making, chemicals for purifying impure water for domestic purposes, chemicals for dyeing and staining leather, &c. Also thermometers, gauges, pyrometers, oil engines, asphalt mixers, lubricating oils, high-pressure boilers, pumps for all purposes, storage tanks, elevated steel tanks, steel storage tanks for water, oil, alcohol, molasses, acids, valves, &c.

American activity is great, and British firms in Calcutta, Bombay, Madras, and other towns are acting as agents. So as to meet the convenience of Indian merchants as regards shipping, some American firms ship from the East Coast (New York) or from the West Coast (San Francisco), whichever route may be selected. In order to save the bulky catalogue an announcement is made:—"Our eight departments A to H named below will be found to contain indispensable information on the trade problems with which its subject is designed to cope. Write for any of the catalogues A to H which interest you."

The Consular Bogey

Consular services of various countries more or less represent the commercial policy and methods of the country to which they belong. A consul, being a State official, cannot run counter to the diplomatic department of his country. Diplomacy comes first, trade afterwards; the consul, therefore, has to obey the diplomatist.

An example has just come to the notice of the writer of the strategy of two commercial countries. Country A is striving hard to increase her trade everywhere; country B is doing likewise. For diplomatic reasons B must not displease the other country, who is getting large slices of B's business. The manufacturers of B's country are most energetic, and crave consular trade information. Consul B has to give tame reports of the increase of A's business; and the reason given is that he does not want to advertise A's goods! But B's manufacturers get the real truth revealed in the pages of the trade journals they subscribe to; otherwise they would be ignorant of the inroads A's merchants are making into their trade.

Chemical Trade Inquiries

THE *Board of Trade Journal* announces that there have recently been an increasing number of cases where firms desirous of obtaining information have addressed their enquiry both to the Department of Overseas Trade, London, and to the Consular Officer or Trade Commissioner of the district or country in which they are interested. It should be understood that the Department of Overseas Trade refers any such enquiries which cannot be directly dealt with to the Commercial Secretaries, Consuls, &c., to whom it looks as its agents in the collection of commercial intelligence. In these circumstances, the method of addressing enquiries to both sources not only leads to needless duplication of work on the part of the Department, the Consul and the firm itself, but frequently causes unnecessary loss of time. It is, therefore, recommended that all such applications for information should be addressed solely to the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, Old Queen Street, London, S.W. 1, except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
South Africa and Rhodesia.	Dyes, Glass, Pottery.	431
British West Indies.	Laundry Soap.	433
Austria (occupied territory).	Oils and Fats, Copra.	434
Belgium.	Coal, Pitch.	435
Denmark.	Preserved Foodstuffs.	453
Serbia.	Petrol, Naphtha and Benzine Engines; Asbestos; Paraffin and Paraffin Schist; Ceresine.	466
Spain.	Fertilizers.	468
Switzerland, Lausanne	Coal and Patent Fuel, Oils, Varnishes, Paints, Soaps.	473

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

- EXPLOSIONS.** Factors limiting the maximum pressures developed in gaseous explosions. W. T. David. *Engineering*, August 22, 251-252.
- GAS.** Steaming of horizontal retorts. P. B. Ellacot. *Gas World*, August 23, 142-143. Paper read before the Irish Association of Gas Managers, describing results obtained at Newry.
- Gas Investigation Committee Report: Reply to criticisms. J. W. Cobb. *Gas World*, August 23, 147-148.
- ITALY.** Recent developments in the chemical industry in Italy. *J. Roy Soc. Arts*, August 22, 631-632. Notes on new electrolytic alkali, chlorine, and hydrogen plants.
- LUBRICATING OIL.** Centrifugal oil purifying machine. *Engineering*, August 22, 238-239. A description of the De Laval machine for separating dirt, water, etc., from lubricating oil.
- MERCURY.** The technical analysis of mercury ores. R. S. Heath. *Chem. News*, August 22, 89-90. A rapid method for estimating mercury in ores is described.
- PYROMETRY.** Use of optical pyrometers for the control of optical glass furnaces. C. N. Fenner. *Engineering*, August 22, 256-257. A paper to be read at the September meeting of the American Institute of Mining and Metallurgical Engineers.

Colonial

- SMELTING.** Electric smelting with special reference to Canadian conditions. R. M. Keeney. *Bull. Canad. Min. Inst.*, August, 846-853. Notes on the smelting of iron, copper, nickel, lead, and zinc ores.

American

- ACETYLENE.** Modified method for analysis of mixtures of ethylene and acetylene. W. H. Ross and H. L. Trumbull. *J. Amer. Chem. Soc.*, August, 1180-1188. A method is given for estimating acetylene in presence of ethylene, etc.
- ANALYSIS.** A new method of chemical analysis. A. W. Hull. *J. Amer. Chem. Soc.*, August, 1168-1175. A new method of X-ray analysis is described.
- BOILER FEED WATER.** Feed water treating and purifying plant. S. H. McKee. *Blast Fur. and Steel Plant*, August, 401-405. Illustrated description of a plant at Youngstown, Ohio, having a capacity of 300,000 gallons per hour.
- BRASS.** Relation of the chemist to the brass industry. W. B. Price. *J. Ind. Eng. Chem.*, August, 770-777. A description of the equipment and work of the laboratories of the Scovill Company.
- CARBIDE.** Carbide conversion calculations. I. E. Knapp. *Chem. and Met. Eng.*, August 1, 139-140. Formulae are given for calculating the efficiency of calcium carbide manufacture.
- CHLORINE.** The Nelson electrolytic chlorine cell. C. F. Carrier. *Chem. and Met. Eng.*, August 1, 133-136. Illustrated description of the construction and working of this cell.
- COKING.** The coking of Illinois coal in Koppers type ovens. R. S. McBryde and W. A. Selvig. *Chem. and Met. Eng.*, August 1, 122-128.
- ENAMELLED WARE.** Acid test enamel ware. W. D. Collins. *J. Ind. Eng. Chem.*, August, 757-759. American enamelled iron ware was tested for antimony and lead.
- ENGINEERS.** Business training for the Engineer. A. Marston. *Eng. and Min. J.*, August 2, 189-190. The importance of business training is emphasised.
- EXPLOSIONS.** Explosion of chemicals. II. Workmen's Compensation Acts. C. C. Sherlock. *Chem. and Met. Eng.*, August 1, 131-132.
- FLUE GAS.** Combustion control in mill boiler plant. R. June. *Blast Fur. and Steel Plant*, August, 398-400. Notes on the analysis and temperature of flue gases.

- GAS WARFARE.** Gas warfare at the front. B. C. Goss. *Proc. Eng. Soc. W. Pa.*, May, 181-194. Gas, smoke, and flame in this war and the next. W. H. Walker, *ibid.*, 195-214. Interesting papers on gas warfare, with an illustrated description of the work at Edgewood Arsenal.
- GERMANY.** Germany's industrial position. R. D. Zucker. *J. Ind. Eng. Chem.*, August, 777-780. A review of the industrial position of Germany before, during, and after the war.
- GLASS.** Recent progress in the manufacture of glasses for protecting the eye from injurious radiations. W. W. Coblenz. *J. Franklin Inst.*, August, 255-261.
- HEATING.** Bibliography of oil fuel for metallurgical furnaces. R. Demorest. *Blast Fur. and Steel Plant*, August, 387-389. Bibliography with brief notes on the chief sources of literature.
- IRON.** Exposure tests of sheeting material. S. L. Hoyt. *Chem. and Met. Eng.*, August 1, 142-144. The tests showed the superiority of "copper-bearing" steel.
- NITRATE.** Production costs of Chilean nitrate. J. Marco. *J. Ind. Eng. Chem.*, August, 780-781. Costs for four oficinas are given.
- NITRIC ACID.** Analytical method of determining the efficiency of ammonia oxidation. D. P. Gaillard. *J. Ind. Eng. Chem.*, August, 745-746.
- OUTPUT.** The economic status of American chemical industry. F. E. Breithut. *Chem. and Met. Eng.*, August 1, 129-131. Charts are given showing the relation of the chemical industry to other industries as regards output, etc.
- Efficiency and productivity of wage and salary earners in the chemical industry. O. P. Hopkins. *J. Ind. Eng. Chem.*, August, 727-738. Numerous figures are presented to show the output of each "wage-earner" and "salary earner" in the chemical and other industries in the United States.
- SEWAGE.** Electrical treatment of sewage. The Landreth direct oxidation process. H. J. M. Creighton. *J. Franklin Inst.*, August, 157-187. Both electricity and lime are used in this process.
- TIN.** Analysis of alloys of tin. A. Craig. *J. Ind. Eng. Chem.*, August, 750-753. A discussion of the accuracy of various methods.

French

- ALGERIA.** Resources of the French Colonies. *Rev. Prod. Chim.*, August 15, 391-396. Algerian chemical and other industries are dealt with.
- FERTILISERS.** Study of the synthesis of nitrogenous fertilisers. H. Allbrand. *Rev. Prod. Chim.*, August 15, 395-398. A description of experiments on the conversion of cyanamide into ammonia and ammonium sulphate, and on the oxidation of ammonia.

German

- ALUMINA.** Manufacture of alumina from clay. V. Gerber. *Z. Elektrochem.*, July 1, 193-208. The author discusses various methods of preparation and purification.
- EVAPORATORS.** Evaporators and the estimation of the efficiency of their heating surfaces. H. Claassen. *Z. angew. Chem.*, August 5, 241-246. Gives methods for calculating heat transmission and for estimating the efficiency of evaporators.
- GAS.** Heating of gas producer furnaces. O. Peischer. *J. Gasbeleucht.*, July 12, 381-385. Notes on heat balances.
- HYDROGEN.** Iron ores for the production of hydrogen. A. von Skopnik. *Chem. Zeit.*, August 2, 481-482. Various ores were studied as regards suitability.
- IRON.** The Balkans as source of raw materials for German metallurgical industries. H. E. Kepler. *Metall. u. Erz.*, July 22, 317-323. Deals with various important iron ore deposits.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. Lists of patent applications and of "convention" specifications open to inspection before acceptance are added; abstracts of the latter appear as soon as possible thereafter.

Abstracts of Complete Specifications

- 116,495. NITRIC ACID, MANUFACTURE OF. Norsk Hydro-Elektrisk Kvaestofaktieselskab, Solligatan, 7, Christiania. International Convention date (Norway), May 8, 1917.

Nitric acid of 97 per cent. strength is produced by the reaction of nitrogen tetroxide, oxygen, and water at a pressure of about 20 atmospheres and temperature of 50° to 70° C.

- 119,234. ELECTRIC MELTING FURNACES. T. F. Baily and F. T. Cope, Rural Free Delivery No. 2, and 1750, South Arch Avenue respectively; Alliance, Ohio, U.S.A. International Convention date (U.S.A.), September 4, 1917.

An electric furnace is provided with a concave hearth, and a concave roof which reflects the heat downward on to the hearth. A trough arranged around the inner wall of the furnace contains the heated resistance material, such as crushed coke, graphite, or carbon. Heat is thus radiated directly on to the hearth from the trough, and the heat radiated upward on to the roof is reflected downward through the central opening surrounded by the trough and on to the hearth. The roof is adapted to be lifted off.

- 119,243. CYANIDES AND NITRIDES, SYNTHETIC PRODUCTION OF. A. R. Lindblad, Gustaf Adolfs Torg 18, Stockholm. International Convention date (Sweden), June 8, 1917.

The material to be treated is charged into a furnace open at the top and heated by suitable electrodes. The gases evolved by the reaction are withdrawn by suction through a conduit at the bottom, so that the nitrogen, or gas containing nitrogen, which is required for the reaction is drawn downward through the charge—i.e., in the same direction of movement as that of the charge. Loss of nitrogen by leakage is thus avoided.

- 130,202. ELECTRIC ARC FURNACES. H. Coates and Watford Electric and Manufacturing Co., Ltd., Whippendell Road, Watford. Application date, December 19, 1917.

An electric arc furnace is provided with an automatic regulator operated by the current strength of the arc, and an automatic switch operated by the voltage across the arc. The latter switch is connected with the regulator, so that it may either permit the regulator to operate normally, or modify its action, so that the arc is lengthened at a more rapid rate than the normal.

- 130,023. AMMONIA, SYNTHESIS OF. E. B. Maxted, 63, Highgate Road, Walsall. Application date, December 21, 1917.

A mixture of nitrogen and hydrogen, or containing a substantial proportion of these gases, is compressed to 50-100 atmospheres, and subjected to the action of an electric arc at a temperature of about 2,000° C. The arc may be that formed by a direct or alternating current, or may be the apparently continuous arc formed between the secondary terminals of an induction coil when they are close together. The gas is then rapidly cooled by direct or indirect contact with water, or by a current of cooler gas. The uncombined portion of the gaseous mixture is circulated back to the arc without reduction of pressure, and fresh gas is added to compensate for the removal of the ammonia.

- 130,063. AMMONIA, SYNTHESIS OF. E. B. Maxted, 63, Highgate Road, Walsall. Application date, January 11, 1918.

A mixture containing nitrogen and hydrogen in substantial proportions is partly burnt, at a pressure of 50 atmospheres and a temperature not below 1,500° C., in air, oxygenated air, or oxygen. The proportions are such that no free oxygen is left after combustion, and the gases are then rapidly cooled by direct or indirect contact with water. The gaseous residue, after removal of the ammonia, may be treated again as above.

- 130,069. AMMONIA, MANUFACTURE OF. Hon. R. C. Parsons, 30, Victoria Street, London, S.W. 1; H. C. Jenkins, Salisbury House, London Wall, London, E.C. 2; and C.I. (1914) Syndicate, Ltd., 30, Great James Street, London, W.C. 1. Application date, January 11, 1918.

Ammonia is manufactured by the catalytic combination of nitrogen and hydrogen. Nitrogen free from argon is obtained by the selective distillation of liquid air, and hydrogen is obtained by the electrolysis of a solution of an alkali metal chloride during the production of the alkali hydroxide. The hydrogen is purified by passing it through a filter of inert material which is moistened with water which has been boiled to free it from dissolved gas, and then through a similar dry filter. The electrolyte may also be boiled before electrolysis to remove dissolved gas. The nitrogen and hydrogen are combined at a high temperature and pressure with the aid of a catalyst, such as pure iron.

- 130,086. EXOTHERMIC CHEMICAL SYNTHESSES TAKING PLACE UNDER PRESSURE AND AT A HIGH TEMPERATURE. L'Air Liquide Société Anonyme pour l'Etude et l'Exploitation des Procédés G. Claude, 48, Rue St. Lazare, Paris. International Convention date (France), March 31, 1917.

Chemical syntheses, such as that of ammonia from oxygen and hydrogen, are carried out at very high pressures—i.e., from 500 to 2,000 atmospheres or higher. The synthesis takes place by passing the gases through a tube containing the catalyst, surrounded by a larger thick-walled tube. The gas passes first into one end of the outer tube, and then over the reaction tube to pre-heat the gas and cool the catalyst. The gas then passes in reverse direction through the catalyst in the inner tube.

- 130,087. (Patent of Addition to the Preceding.) International Convention date (France), August 7, 1917.

In order to increase the fall of temperature through the wall of the thick-walled tube referred to above, and thus avoid overheating, the wall is lined internally with asbestos cord supported by a thin metal tube. Alternatively, the coating may be an enamel which is a bad heat-conductor, is not acted upon by the gas, and resists a temperature of 600° to 700° C. without cracking. A mixture of clay, sand, sodium carbonate, and borax is mentioned.

- 130,092. GASEOUS MIXTURES, SEPARATION OF—AND PARTICULARLY THE EXTRACTION OF HYDROGEN FROM GASEOUS MIXTURES. L'Air Liquide, Société Anonyme pour l'Etude et l'Exploitation des Procédés G. Claude, 48, Rue St. Lazare, Paris. International Convention date (France), April 16, 1917.

Hydrogen contained in water gas, coke-oven gas, coal gas, and the like is separated by passing the mixture through a column in counter current to a solvent, such as alcohol, acetone, ethyl or butyl acetate, benzene, &c. The gas is circulated at a pressure of about 1,000 atmospheres, when the gases other than hydrogen are absorbed and the latter separated. Loss of solvent is avoided by liberating the dissolved gases at 50 atmospheres, and the solvent is then used over again.

- 130,106. COKE OVENS AND THE LIKE, REGULATING THE PRESSURE IN THE GAS MAINS OF. Simon-Carves, Ltd., and J. T. E. Preston, 20, Mount Street Manchester. Application date, April 23, 1918.

A floating bell, diaphragm, or the like is sustained by the pressure in the gas main, and by its movement actuates a lever which may complete the circuit through one or other of two solenoids. The armatures of the solenoids are connected to the two ends of a lever, the movement of which actuates a valve in the main through which the gas is drawn off. An upward movement of the bell, due to increased pressure in the main, actuates the mechanism so that the control valve is opened wider, and a downward move-

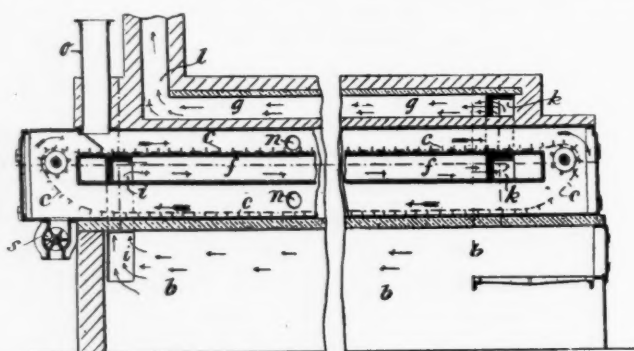
ment of the bell causes a partial closing of the valve, thus tending to maintain a constant pressure in the main.

- 130,173. CARBONATES AND/OR HYDRATES OF POTASSIUM AND SODIUM, SEPARATION OF. Distillates, Ltd., and G. G. Jarman, Kirkheaton, near Huddersfield. Application date, August 2, 1918.

The solution of carbonates or hydroxides is treated with a sufficient quantity of fatty acids or other saponifiable matter so that when boiled, evaporated, and cooled, the soap, which has absorbed the whole of the soda, will rise to the top and may be removed. The liquid then contains the potassium salt only. The soda may be recovered by treating the soap with an acid, and the saponifiable matter may then be used over again.

- 130,175. MECHANICAL RETORTS OR HEATING CHAMBERS. T. Phillips, 21, Barnstaple Street, Bideford, Devon. Application date, August 8, 1918.

A retort for carbonising or otherwise treating material is heated by a furnace flue *b*, from which the gases pass upward by a passage *i* to the flue *f*. The material is carried over the top of



130,175

this flue by an endless conveyor *c*, and vapour is withdrawn through outlets *n*. The hot gases then pass by flue *k* into flue *g*, and thence to the outlet *l*. The material is fed into the passage *o* on to the conveyor *c*, and the treated material is discharged through the rotary valve *s*.

- 130,181. EVAPORATORS. J. A. Reavell, 28, Oakwood Avenue, Beckenham, Kent, and Kestner Evaporator and Engineering Co., Ltd., 37, Parliament Street, London, S.W. 1. Application date, August 9, 1918.

A climbing or falling film apparatus for concentrating, evaporating, or distilling is provided with means for pre-heating the liquid. The vertical casing containing the evaporating tubes contains also two additional vertical tubes or sets of tubes opening into the spaces at the top and bottom of the casing. These spaces are divided by partitions in such a way that the liquid passes upward through one set of tubes and downward through the other before passing into the adjacent evaporating tubes. All the tubes are heated by steam, which is passed through the casing.

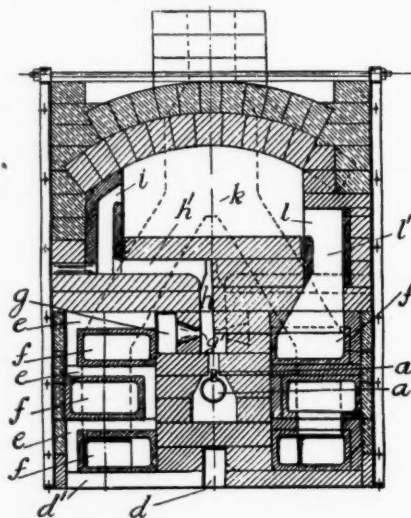
- 130,205. ELECTRIC FURNACES. J. R. Hoyle and P. W. Fawcett, Norfolk Works, Sheffield. Application dates, September 20, 1918, and January 3, 1919.

Combustion of the carbon electrode where it passes through the roof of the furnace is prevented by surrounding it with a conical shield made in two pieces. The base of the shield rests around the opening through which the electrode projects, and the upper portion closely surrounds the electrode. The part of the roof through which the electrode passes is provided with a water-cooled ring.

- 130,274. GAS-HEATED FURNACES. King, Taudevin & Gregson, Ltd., W. Gregson & J. King, Melbourne Chambers, Cambridge Street, Sheffield. Application date, February 1, 1919.

Gas is supplied by the pipe *a* to the series of nozzles *a'*. Air enters by the longitudinal passage *d* and ports *d'* into tortuous passages *e*, formed by grooves on the top and one side of the

hollow bricks which constitute the conduits *f*. The pre-heated air then passes into longitudinal passages *g*, and thence to nozzles *g'* immediately over the gas nozzles *a'*. The mixture burns in the



130,274

passages *h*, *h'*, *i*, and passes into the heating chamber *k*. The waste gas passes by the flues *l*, *l'*, and zigzag flues *f* to the outlet.

- 130,288. ELECTRIC FURNACES. G. Marriott, Walmer House, Mount View Road, Norton, Sheffield. Application date, March 3, 1919.

The furnace hearth is built up from the bottom with a thin layer of fine dolomite and tar, then a layer of asbestos millboard which also extends up the sides, and then a copper terminal plate placed centrally on the asbestos and covered by a layer of graphite powder. The copper plate and graphite are surrounded up to the same level by thin magnesite bricks, which also extend up the side walls. The shell thus formed contains a thick bed of dolomite 60 per cent., magnesite 30 per cent., fine metal turnings 8 per cent., graphite 2 per cent., with a tar binder. This is surmounted by a thinner layer of similar composition, which carries the usual sloping banks surrounding the central cavity. The banks are surmounted by a thin layer of fine chrome ore, and this by the usual silica-brick furnace wall.

International Convention Specifications Open to Inspection

- 128,536. CONCRETE, &C., MIXING. C. Candlot, 37, Rue du Roche, Paris. International Convention date, June 17, 1918.

Cement, sand, gravel, &c., are distributed from separate hoppers to a mixing receptacle to which water is supplied. The mixed materials then pass to a horizontal rotating drum with internal blades, from which the concrete is delivered.

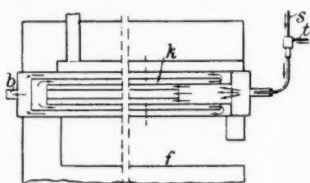
- 128,578. HALOHYDRINS. Commercial Research Co., Jackson Avenue, New York (Assignees of B. T. Brooks, Jackson Avenue, New York). International Convention date, June 20, 1918.

To obtain halohydrins such as chlorhydrin, gaseous unsaturated hydrocarbons such as olefines are treated with a solution of hypochlorous acid under pressure. An apparatus suitable for the process is described. The process is applicable to the treatment of the gases obtained by cracking petroleum in order to obtain propylene chlorhydrin and ethylene chlorhydrin.

- 128,549. SULPHUR BURNERS. M. Krotoff, Bondy par Nieul, Haute Vienne, France. International Convention date, June 15, 1918. (See illustration.)

Finely powdered sulphur is passed through the pipe *s* into the furnace, and burned to sulphur dioxide by an air blast injected by the pipe *t*. The burning gases pass backward and forward through

a series of concentric tubes *k*, and a gas rich in sulphur dioxide is finally discharged by the outlet *b*. The furnace is suitable for



128 549

combustion of other solid substances, and is maintained by the heat of the reaction after once being started.

LATEST NOTIFICATIONS.

- 131,269. Lime, cement and like kilns, Automatically discharging. C. Candlot. August 10, 1918.
- 131,273. Solvents, Recovering. E. I. Du Pont de Nemours & Co. August 8, 1918.
- 131,293. Paraffin residue, Producing cakes of solid crude. A. Szekely. May 30, 1918.
- 131,301-2-3. Paraffin, Process for converting into acids. Pardubitzer Fabrik der Akt-Ges. fur Mineralol-Industrie vorm D. Fanto & Co. September 9, 1916, November 17, 1917, and January 29, 1918.
- Specifications Accepted, with Date of Application**
- 29,628 of 1913. Reducing-agents, and Process for Manufacturing same. Goldstein. December 23, 1912.
- 130,343. Iron, Manufacture of. G. J. Stock. October 14, 1916.
- 130,358. Hydrogen, Manufacture of Compressed. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claudes. August 9, 1917.
- 130,362. Tar, Separation of Oils and Pitch from. R. Lessing. March 28, 1918.
- 130,365. Ammonia, Conversion of Synthetic, into a Solid Product in conjunction with the Production of Carbonate of Soda. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claudes. August 25, 1917.
- 130,381. Aluminium Alloys. W. A. Naish. August 6, 1918.
- 130,383. Gases, Material for removing Carbon Monoxide from. South Metropolitan Gas Co. and J. M. Somerville. February 7, 1918.
- 130,399. Organic Acid Anhydrides and Chlorides, Manufacture of. Boake, Roberts & Co. and T. H. Durrans. February 15, 1918.
- 130,402. Cellulose Acetate Solutions, Production of. Cellon, Ltd., T. Tyrer & Co., P. H. Chambers, and G. T. Feasey. February 15, 1918.
- 115,236. Colloidal Solutions, Manufacture of. J. Muller. March 3, 1917.
- 130,455. Fuels, Treatment of Certain, to Improve their Calorific Value. W. A. Bone. July 30, 1918.
- 130,475. Gas fired Furnaces. Smeeton-Wright Furnaces, Ltd., J. E. Fletcher, and T. Wright. August 1, 1918.
- 130,479. Regenerator Chambers of Furnaces and the like, Chequer Bricks for. T. Williams and South Durham Steel and Iron Co. August 9, 1918.
- 130,483. Zinc-melting Apparatus. T. Aramaki. August 14, 1918.
- 119,228. Electric Furnaces. A. D. Keene. September 5, 1917.
- 130,528. Indiarubber Compositions or Substitutes therefor. W. F. MacDonald. November 21, 1918.
- 122,630. Alcohols, Preparation of the Primary. Soc. Chimique des Usines du Rhone, Anciennement Gilliard, P. Monnet, et Cartier. January 22, 1918.

We are advised by the Amsterdam Superphosphate and United Chemical Works that their works, with a total output of 400,000 tons per annum, have combined and have opened central offices at Utrecht (Maliëbaan 81). They have also opened a London office (temporary address 33, Bishopsgate, E.C. 2) and have placed the management in the hands of Mr. Herbert A. Butts.

Government Contracts

THE following contracts were placed by the Government during July, 1919:—

MINISTRY OF MUNITIONS (WAR OFFICE CONTRACTS).

Clothing, Dyeing of: Achille Serre, Ltd., London, E.; Brunswick Dyeing and Cleaning Co., Ltd., Portsmouth; Flinn & Sons, Ltd. Brighton; French Cleaning and Dyeing Co., Ltd., London, N.; Lush & Cook, London, E.; A. & J. MacNab, Ltd., Slاتفورد; Rogers & Cook, Ltd., London, S.W.

Leather: S. Barrow & Brother, Ltd., London, S.E.; Liverpool Tanning Co., Ltd., Litherland, Liverpool; W. Reynolds & Co., Ltd., Warrington; Vernon Street Tanning Co., Ltd., Warrington; W. Walker & Sons, Ltd., Bolton; Whitmore (Eden Bridge), Ltd., Eden Bridge, Kent.

Medicines: Boots Pure Drug Co., Ltd., Nottingham; Borax Consolidated, Ltd., Glasgow; I. Spencer & Co., Aberdeen.

INDIA OFFICE: STORE DEPARTMENT.

Cement: Ship Canal Portland Cement Co., Ellesmere Port.

Copper: United Brass Founders and Engineers, Cornbrook, Manchester.

Paint and White Lead: Brimsdown Lead Co., Brimsdown.

H.M. STATIONERY OFFICE.

Candles: Price's Patent Candle Co., Ltd., London, S.W.

Jelly, Petroleum: Messrs. Kingfisher, Leeds.

Salammoniac: Brunner, Mond & Co., Ltd., Winnington, Northwich.

CROWN AGENTS FOR THE COLONIES.

Drugs, &c.: Burgoyne, Burbidge & Co., East Ham, E.

Lead, White: Locke, Lancaster & W. R. Johnson & Son, London, E.C.

Oils: Price's Co., Ltd., London, S.W.

Oil, Linseed: J. L. Seaton & Co., Hull.

Oil, Lubricating: C. C. Wakefield & Co., London, E.C.

Paint: Alex. Fergusson & Co., Maryhill, Glasgow; Foster, Blackett & Wilson, Ltd., Hebburn-on-Tyne; Red Hand Compositions Co., London, E.C.

Pipes, Copper: Yorkshire Copper Works, Ltd., Leeds.

Plates, Mild Steel: P. & W. McClellan, Ltd., Glasgow.

Powder, Blasting: Curtis & Harvey, Ltd., London, E.C.

Soap, Carbolic: Isdale & McCullum, Ltd., Paisley.

H.M. PRISON COMMISSION.

Leather: Pocock Bros., London; J. Dixon, Sons & Taylor, London, S.E.

Oatmeal, &c.: C. T. Cox & Sons, London, E.C.

Oilman's Stores: J. F. Percival, Ltd., London, S.E.

Soap, Yellow: Price's Patent Candle Co., Ltd., Battersea, S.W.

Soap, Carbolic: John Knight, Ltd., Silvertown, E.

These contracts are for year April 1st, 1919, to March 31st, 1920.

Importation of Bones, Bone Meal, &c.

THE *Gazette* contains a copy of Notification No. 225, dated June 27, which has been issued under the "Animals Diseases Consolidation Ordinance, 1904," of Southern Rhodesia, and which provides that the following Regulations shall be in force from June 27, viz.:—

No person shall import any bones (for use), or any material wholly or partially manufactured or derived from bone, such as bone meal, bone flour, bone dust, dissolved bones, bone compound, or the like, unless such bones shall have been sterilised by subjection either to: (a) a dry heat of 140 deg. centigrade for not less than three hours; or (b) a moist heat (under pressure) of 105 deg. centigrade for not less than fifteen minutes. A declaration to this effect shall be furnished by the importer with the application for registration under Section 1 of Government Notice No. 421 of 1914, and, further, in any sale effected the seller shall furnish to the buyer the said declaration, in addition to the invoice required by Sections 6 and 7 of the said notice. Any person contravening these regulations shall be liable to the penalty provided under the Ordinance. If at any time it shall subsequently appear that any person has made such declaration falsely, he shall be liable to the penalty provided under the Ordinance.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. Only commodities whose values are at the time of particular interest or of a fluctuating nature are included in our weekly report. A more complete list and report is published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report. Suggestions and criticisms in regard to these pages will be welcomed.

British Market Report

THURSDAY, August 28, 1919.

THE home trade has been on the quiet side, but values are generally maintained.

Export business has been very active, with a heavy demand for Alkali products. The exchange question makes it very difficult to conclude business satisfactorily, and sellers are not so eager as they were in making offers.

General Chemicals

ACID TARTARIC.—There has been a good business passing, and the price is well maintained.

ACID ACETIC.—Several shipments from America have been short-shipped, and spot parcels are becoming scarce.

ACID CARBOLIC.—The firm position is easily maintained owing to the good export demand.

AMMONIUM SALTS are moving off well, and makers are heavily sold.

ANILINE OIL AND SALT.—Important inquiries are still being received from the Eastern markets, and a fair amount of business is passing.

BLEACHING POWDER.—There is a slight improvement in the demand, which is very welcome.

BORAX is still in active demand, but in extremely short supply for near delivery, and substantial premiums are being paid.

BETANAPHTHOL.—The position is rather unsatisfactory for the consumers. There is keen inquiry for prompt delivery, which manufacturers have difficulty in meeting. They are heavily booked forward.

COPPER SULPHATE is lifeless, with no business passing.

FORMALDEHYDE.—Stocks are being rapidly absorbed, and higher prices realised. Deliveries from America are delayed through various causes.

IRON SULPHATE (Green Copperas) is slow of demand and price easy.

LEAD ACETATE is active and moving off well.

LEAD CARBONATE (White Lead).—Corroders are heavily engaged and cannot cope with the greatly increased demand.

LITHOPONE.—This market appears to be able to absorb incoming shipments in addition to the home production.

METHYL ALCOHOL.—American makers have raised their quotation, and will probably notify a further advance shortly.

MAGNESIUM SULPHATE is dull, both for home trade and for export.

SODA NITRATE.—Only small business is passing, and competition is keener than ever.

SODIUM BICARBONATE is very active, with a strong demand for export. Higher prices are being realised for re-sale parcels.

SODIUM CAUSTIC is in more active request, and the price is rather firmer.

SODIUM PHOSPHATE is better, and the price has hardened.

TECHNICAL RESORCIN.—The production is temporarily held up. Manufacturers cannot promise deliveries before September–October.

ZINC SALTS.—Only a moderate trade is passing.

Heavy Coal Tar Products

The market generally is steady, and in the case of some products, distinctly firmer, but business is still limited, owing to the uncertainty respecting future production.

BENZOL is still in good demand for the home trade, and the export price is unchanged at 1s. 10d.—1s. 10½d. per gallon, f.o.b. There is, however, some uncertainty regarding the near future on account of the rather large Government stocks which have been put upon the market this week.

CREOSOTE is quietly steady and unchanged in price.

CRESYLIC ACID.—There is still some demand, but the higher prices appear to have checked business. Pale, 97 per cent., is quoted at 2s. 4½d. to 2s. 6d. per gallon, and dark, 95 per cent., 2s. 3d. to 2s. 4½d. per gallon.

NAPHTHALENE is quiet, with no change in prices.

PITCH.—The demand is good, and 72s. 6d. has been paid f.o.b. East Coast and South Coast. There are sellers at 70s. per ton on the West Coast, but buyers are unwilling to pay much over 65s.

SOLVENT NAPHTHA.—There is a good demand, and prices are distinctly steady at 2s. to 2s. 2d. per gallon in the North and 2s. 2d. to 2s. 3d. per gallon in the South.

Sulphate of Ammonia

The fixed prices for the home trade are still in force, and, owing to the refusal of export licences, nothing is being done for any period for export.

French Market Report

Trade has slightly improved in France, but the volume of business is still very moderate.

Stocks are, however, being quickly reduced, and with the exchange in its present position there is not much desire to purchase far ahead.

ACID LACTIC is in fair demand.

ACID OXALIC is lower in price, with little business passing.

ALUM.—There is a better demand, and some good orders have been booked for English makes.

AMMONIA AQUA is active, and some good quantities have been shipped.

BORAX is in request and very scarce. High premiums have been paid for near delivery.

CHLORIDE is still very dull and easy.

HYPOSULPHITE is quietly in demand, but the domestic output is sufficient to cope with present requirements.

LEAD ACETATE is in good demand, some of the expected shipments from American manufacturers not having been received. The English product is standing at equal to £85 per ton, c.i.f. French port.

LITHOPONE has been very active and has been imported from America in fair quantities recently. A certain amount of business, however, has been transacted in the Dutch make.

NAPHTHALENE SALTS are stagnant, with no business whatever passing with the exception of a few orders for marbles, which are standing in the region of £48 per ton.

RED AND WHITE LEAD is extremely scarce, especially for white.

POTASSIUM SALTS are extremely scarce, but buyers are very nervous and only order on a hand-to-mouth basis. The position may be expected to improve to a certain extent shortly.

SODIUM SALTS.—The stocks of caustic soda have been reduced somewhat and there is a better demand. No considerable orders, however, have been placed recently for English make. The price may be taken at about £20 per ton, c.i.f. French port.

SODIUM SULPHIDE is in better demand, and is in request at prices equal to £24 per ton concentrated.

SODIUM BISULPHITE has been very active, and a number of orders have been placed at figures approximating £33 per ton, c.i.f.

SULPHATE AND OXIDE are in better demand.

Coal Tar Products

There is a better feeling apparent, and a few fair-sized orders have been placed in this country; an improvement in this market may shortly be looked for.

Current Prices

Chemicals		August 28, 1919.	
	per	£ s. d.	£ s. d.
Acetic anhydride	lb.	0 2 9	to 0 3 0
Acetone oil	ton	75 0 0	to 80 0 0
Acetone, pure	ton	95 0 0	to 97 0 0
Acid, Acetic, glacial, 99-100%	ton	82 10 0	to 84 0 0
Acetic, 80% pure	ton	13 0 0	to 65 0 0
Arsenic	ton	50 0 0	to 52 0 0
Boric, cryst.	ton	72 10 0	to 73 10 0
Carbolic, cryst. 39-40%	lb.	0 0 9	to 0 0 9½
Citric	lb.	0 4 5	to 0 4 7
Formic, 90%	ton	125 0 0	to 135 0 0
Gallic, pure	lb.	0 6 3	to 0 6 6
Hydrofluoric	lb.	0 0 7	to 0 0 8
Lactic, 50 vol.	ton	66 0 0	to 68 0 0
Lactic, 60 vol.	ton	80 0 0	to 82 0 0
Nitric, 80 Tw.	ton	3 0 0	to 34 0 0
Oxalic	lb.	0 1 2	to 0 1 2½
Phosphoric, 1.5	ton	40 0 0	to 42 0 0
Pyrogallic, cryst.	lb.	0 11 6	to 0 11 9
Salicylic, Technical	lb.	0 2 0	to 0 2 2
Salicylic, B.P.	lb.	0 2 6	to 0 2 8
Sulphuric, 92-93%	ton	7 10 0	to 8 0 0
Tannic, commercial	lb.	0 2 9	to 0 3 0
Tartaric	lb.	0 3 2	to 0 3 3
Alum, lump	ton	17 10 0	to 17 15 0
Alum chrome	ton	97 0 0	to 19 0 0
Aluminium, sulphate, 14-15%	ton	14 0 0	to 14 10 0
Aluminium, sulphate, 17-18%	ton	17 10 0	to 18 0 0
Ammonia, anhydrous	lb.	0 1 10	to 0 2 2
Ammonia, .880	ton	32 10 0	to 37 10 0
Ammonia, .920	ton	20 0 0	to 24 0 0
Ammonia, carbonate	lb.	0 0 6½	to —
Ammonia, chloride	ton	60 0 0	to 65 0 0
Ammonia, muriate (galvanisers)	ton	44 0 0	to 45 0 0
Ammonia, nitrate	ton	55 0 0	to 57 10 0
Ammonia, phosphate	ton	115 0 0	to 120 0 0
Ammonia, sulphocyanide	lb.	0 1 10	to 0 2 0
Amyl, acetate	ton	215 0 0	to 220 10 0
Arsenic, white, powdered	ton	55 0 0	to 57 10 0
Barium, carbonate	ton	13 0 0	to 14 0 0
Barium, carbonate, 92-94%	ton	13 10 0	to 14 10 0
Chloride	ton	25 10 0	to 26 10 0
Nitrate	ton	51 0 0	to 52 0 0
Sulphate, blanc fixe, dry	ton	25 10 0	to 26 0 0
Sulphate blanc fixe, pulp	ton	15 10 0	to 16 0 0
Bleaching powder, 35-37%	ton	13 0 0	to 13 10 0
Borax crystals	ton	51 0 0	to 53 0 0
Calcium acetate, grey	ton	21 0 0	to 23 0 0
Carbide	ton	28 0 0	to 30 0 0
Chloride	ton	9 0 0	to 9 10 0
Carbon bisulphide	ton	58 0 0	to 59 0 0
Cerium oxalate	lb.	0 3 9	to 0 4 0
Cobalt acetate	lb.	0 7 0	to 0 7 6
Oxide	lb.	0 7 9	to 0 8 0
Copper chloride	ton	45 0 0	to 46 0 0
Sulphate	ton	235 0 0	to 240 0 0
Cream of tartar, 98-100%	ton	125 0 0	to 130 0 0
Epsom salts (see Magnesium sulphate)	ton	0 4 0	to 0 4 3
Formaldehyde	lb.	0 3 0	to 0 3 5
Formosul (Rongalite)	gal.	0 2 8	to 0 2 9
Glauber salts	ton	32 0 0	to 34 0 0
Hydrogen peroxide, 12 vols.	gal.	0 2 8	to 0 2 9
Iron perchloride	ton	32 0 0	to 34 0 0

	per	£ s. d.	£ s. d.
Iron sulphate (Copperas)	ton	4 10 0	to 4 15 0
Lead acetate, white	ton	82 10 0	to 85 0 0
Lead nitrate	ton	57 0 0	to 58 0 0
Litharge	ton	—	—
Lithophone, 30%	ton	44 0 0	to 45 0 0
Magnesium chloride	ton	15 0 0	to 16 0 0
Carbonate, light	cwt.	3 0 0	to 3 5 0
Sulphate (Epsom salts commercial)	ton	11 10 0	to 12 10 0
Sulphate (Druggists')	ton	17 0 0	to 18 0 0
Methyl acetone	ton	89 0 0	to 90 0 0
Alcohol, 0.1% acetone	gall.	0 10 6	to 0 11 0
Nickel ammonium sulphate, single salt	ton	47 10 0	to 52 10 0
Potassium bichromate	lb.	0 1 6	to 0 1 7
Carbonate, 90%	ton	95 0 0	to 97 10 0
Chloride	ton	Nominal.	—
Chlorate	lb.	0 1 2	to 0 1 3
Meta-bisulphite, 50-52%	ton	224 0 0	to 240 0 0
Nitrate refined	ton	58 0 0	to 60 0 0
Pernanganate	lb.	0 3 6	to 0 3 9
Prussiate red	lb.	0 6 0	to 0 6 3
Prussiate, yellow	lb.	0 1 9	to 0 1 10
Salammoniac, firsts	cwt.	4 0 0	—
Seconds	cwt.	3 15 0	—
Sodium acetate	ton	52 0 0	to 55 0 0
Arsenate, 45%	ton	48 0 0	to 50 0 0
Bicarbonate	ton	9 0 0	to 9 10 0
Bichromate	lb.	0 0 8	to 0 0 8½
Bisulphite, 60-62%	ton	30 0 0	to 32 0 0
Chlorate	lb.	0 0 6½	to 0 0 7
Caustic, 70%	ton	21 0 0	to 21 10 0
Caustic, 76%	ton	23 10 0	to 24 0 0
Hydrosulphite, powder, 85%	lb.	0 3 3	to 0 3 6
Hyposulphite, commercial	ton	18 10 0	to 19 10 0
Nitrite, 96-98%	ton	58 10 0	to 60 0 0
Phosphate, crystal	ton	30 0 0	to 32 0 0
Perborate	lb.	0 2 2	to 0 2 4
Prussiate	lb.	0 0 7½	to 0 0 7½
Sulphide, crystals	ton	15 10 0	to 16 0 0
Sulphide, solid, 60-62%	ton	22 0 0	to 23 10 0
Sulphite, cryst.	ton	11 0 0	to 11 10 0
Strontium carbonate	ton	85 0 0	to 90 0 0
Nitrate	ton	85 0 0	to 90 0 0
Sulphate	ton	8 0 0	to 10 0 0
Sulphur chloride	ton	38 0 0	to 40 0 0
Flowers	ton	24 0 0	to 26 0 0
Roll	ton	23 0 0	to 25 0 0
Tin perchloride, solution	lb.	0 1 6	to 0 1 9
Perchloride, solid	lb.	0 2 6	to 0 2 9
Protochloride, crystals	lb.	0 1 8	to 0 1 9
Zinc chloride 102 Tw.	ton	22 0 0	to 23 10 0
Chloride, solid, 96-98%	ton	59 0 0	to 52 10 0
Oxide, 99%	ton	77 10 0	to 80 0 0
Oxide, 94-95%	ton	60 0 0	to 62 10 0
Dust, 90%	ton	70 0 0	to 72 10 0
Sulphate, 99%	ton	21 10 0	to 23 0 0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0 3 0	to 0 3 6
Alphanaphthol, refined	lb.	0 3 6	to 0 3 9
Alphanaphthylamine	lb.	0 2 6	to 0 2 9
Aniline oil, drums free	lb.	0 1 3	to 0 1 4
Aniline salts	lb.	0 1 3½	to 0 1 4
Anthracene, 85-90%	lb.	0 1 5	to 0 1 6
Benzaldehyde (free of chlorine)	lb.	0 3 6	to 0 3 9
Benzidine, base	lb.	0 5 6	to 0 6 0
Benzidine, sulphate	lb.	0 4 9	to 0 5 0
Benzoic, acid	lb.	0 5 0	to 0 5 3
Benzoate of soda	lb.	0 5 0	to 0 5 3
Benzyl chloride, technical	lb.	0 1 9	to 0 2 0
Betanaphthol benzoate	lb.	1 6 0	to 1 7 6
Betanaphthol	lb.	0 2 3	to 0 2 6
Betanaphthylamine, technical	lb.	0 6 6	to 0 7 0
Dichlorobenzol	lb.	0 0 5	to 0 0 6
Diethylaniline	lb.	0 7 0	to 0 8 0
Dinitrobenzol	lb.	0 1 4	to 0 1 6
Dinitrochlorobenzol	lb.	0 1 2	to 0 1 3
Dinitronaphthalene	lb.	0 2 0	to 0 2 3
Dinitrotoluol	lb.	0 1 10	to 0 2 0
Dinitrophenol	lb.	0 1 10	to 0 2 0
Dimethylaniline	lb.	0 2 9	to 0 3 0
Diphenylamine	lb.	0 3 0	to 0 3 3
H-Acid	lb.	0 7 6	to 0 8 0
Metaphenylenediamine	lb.	0 4 6	to 0 4 9
Monochlorobenzol	lb.	0 0 9	to 0 0 10
Naphthionic acid, crude	lb.	0 3 6	to 0 3 9
Naphthylamin-di-sulphonic acid	lb.	0 4 6	to 0 5 0
Nitronaphthalene	lb.	0 1 2	to 0 1 6

Company News

BROKEN HILL PROPRIETARY.—The figures just cabled from Melbourne show that the net profit for the year ended May 31 was £652,342, as against £650,587 in the previous year. The production in the mining branch of the business is shown in the following table:—

	May 31, 1918.	May 31, 1919.
	Tons.	Tons.
Pig iron	109,154	155,172
Steel ingots	141,889	178,000
Coke	109,069	174,000
Sulphate of ammonia ..	1,718	2,630
Tar, galls.	1,123,235	1,673,000

ENGLISH OILFIELDS, LTD.—In order to provide the necessary funds for the carrying out of operations on a large commercial scale over its extensive oil-shale properties in West Norfolk, an extraordinary meeting of the shareholders of English Oilfields, Ltd., will be held on Monday next. Although resolutions will be proposed to increase the capital up to £1,500,000, it is the intention of the directors to issue only about 300,000 new shares, and these will be offered to shareholders only. Though as yet the terms are not made public, it is known that the new offer will represent a very substantial bonus to the present holders. The resulting new capital will be used in the immediate erection of large works capable of dealing with the commercial mining and retorting of the shales, which are now being produced in daily increasing quantities.

EUROPEAN OILFIELDS CORPORATION.—At a special meeting of Debenture stockholders in London, on Tuesday, the scheme for amalgamation with other Russian oil companies was sanctioned. Mr. Herbert Allen, who presided, stated that the Debenture holders will get 50 per cent. of the normal amount of their debentures in "A" shares of the new company, and 50 per cent. in fully-paid "B" shares. Interest up to the date of amalgamation will be paid in cash.

LAKE HURON STEEL.—The Lake Huron Steel Corporation, representing American capital chiefly, has secured sites of 250 acres at Goderich, Ontario, and during the next 12 months will spend £400,000, and in the following year £1,200,000 in establishing plant for the manufacture of high-class steel products.

LOBITOS OILFIELDS.—Shareholders of Lobitos Oilfields, registered on May 13, are to be allotted as a bonus, two shares of £1 each, fully paid, in the Anglo-Ecuadorian Oilfields, Ltd., for every five Lobitos shares held, fractions being payable in cash. The certificates will be issued on or before September 3.

RUBBER CURING PATENTS SYNDICATE.—The net profit for 1918, including £3,425 brought forward, amounts to £9,626, against £4,747. The directors have carefully considered the question of the payment of a dividend, but they are unable to recommend the payment of one for the reason that patents stand in the books at £30,000, and, although six years have elapsed since the syndicate was formed, no depreciation of this asset has in the past been possible. The directors recommend that £7,500 be used in the reduction of the item of patents, and the balance of £2,126 be carried forward.

THE MANBRE SACCHARINE CO., LTD.—At an extraordinary general meeting on August 19, resolutions were confirmed that the company be wound up voluntarily, that Mr. H. P. Tongue, secretary to the company, be appointed liquidator, and that the liquidator be authorised to consent to the registration of a new company under the style of "Manbre Sugar and Malt, Ltd."

WALTER SCOTT, LTD.—Mr. J. T. Middleton, chairman of directors of Messrs. Walter Scott (Ltd.), presiding at the annual general meeting of the company at Newcastle, on Wednesday, said the production of finished steel was down about 10 per cent. on the year, and the cost of production had risen, owing to the great increase in the price of coal and other material, and of wages. In all departments there was a general tendency on the part of the workmen to produce less material per shift than formerly. They had a fair amount of orders in hand, but billets, blooms, rails, and tramway rails were now being offered and supplied to this country by America at prices less than the company's cost of manufacture. Under all the circumstances the outlook for the future was most uncertain, and in no way encouraging.

A CORRESPONDENT in Prince Edward Island desires to obtain the addresses of United Kingdom exporters of superphosphate, basic slag, Paris green, arsenate of lead (powder and paste), arsenate of lime, and also potash for agricultural purposes.

A FIRM in Constantinople, already holding important United Kingdom agencies, wish to get into touch, with a view to obtaining additional agencies, with United Kingdom manufacturers or exporters of the following lines:—Glass and enamelled ware, perfumery, chemicals, waterproofs, linoleum, oilcloth, and rubber goods. The firm claim to have been in the market for about twenty-five years, and to be in a position to act as agents in a highly satisfactory way.

	per lb.	£	s.	d.	to	£	s.	d.
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol ..	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol ..	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	0	to	0	2	3
Orthonitrotoluol ..	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol ..	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	4	0	to	0	4	6
Paranitrotoluol ..	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride ..	lb.	0	6	0	to	0	7	6
Resorcin, technical ..	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	0	to	0	2	8
Salol	lb.	0	4	9	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	2	to	0	1	3
Tolidine, base	lb.	0	9	0	to	0	10	0
Tolidine, mixture ..	lb.	0	2	9	to	0	3	0

Miscellaneous and Paint Materials

Barytes	ton	11	0	0	to	13	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipitated (light)	ton	20	0	0	to	24	0	0
Chalk, precipitated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Cornwall)	ton	1	12	6	to	3	12	6
Coke (blast furnace) ..	ton	3	15	0	to	4	0	0
Coke (foundry)	ton	3	15	0	to	4	5	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake ..	ton	43	10	0	to	45	10	0
Lead, red	cwt.	2	2	6	to	2	7	6
Lead, white	cwt.	2	10	0	to	2	15	0
Ultramarine	ton	85	0	0	to	105	0	0
Prussian Blue	cwt.	11	0	0	to	11	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	8	0	0	to	10	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30% ..	lb.	0	1	5	to	0	1	8

The following prices are furnished by Messrs. Miles Mole & Co. Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro-Alloys

Aluminium, 98-99% ..	ton	150	0	0				
Antimony (English) ..	ton	43	0	0	to	44	0	0
Copper, best selected ..	ton	110	0	0	to	112	0	0
Ferro-chrome, 60% ..	ton	55	0	0	to	56	0	0
Ferro-manganese, 76-80%	ton	25	0	0	to	26	0	0
Ferro-silicon, 45-50% ..	ton	22	0	0	to	25	0	0
Ferro-tungsten, 75-80%	lb.	0	3	0	to	0	3	1
Lead (ingot)	ton	24	10	0	to	24	12	6
Lead (sheets)	ton	33	0	0	to	34	0	0
Nickel, 98-99%	ton	205	0	0	to	206	0	0
Tin	ton	270	0	0	to	271	0	0
Zinc (spelter)	ton	42	10	0	to	43	10	0

Structural Steel

Angles and tees	ton	17	5	0	to	18	0	0
Flats and rounds	ton	21	0	0	to	21	10	0
Joists	ton	17	15	0	to	18	0	0
Plates	ton	19	15	0	to	20	5	0
Rails, heavy	ton	16	10	0	to	17	0	0
Sheets, 24 G. black ..	ton	23	0	0	to	24	0	0
Sheets, galvanised corrugated	ton	30	0	0	to	31	0	0

Building Materials

Bricks, stock	1000	3	16	0	to	3	17	0
Bricks, blue Staffs ..	1000	8	0	0	to	8	5	0
Firebricks, Stourbridge	1000	9	2	6	to	9	5	0
Fireclay, Stourbridge ..	ton	1	17	0	to	1	18	6
Glass, sheet, 21oz. ..	ft.	0	0	8½	to	0	0	8½
Lime, ground blue Lias ..	ton	2	5	0	to	2	7	6
Lime, grey stone	ton	2	13	0	to	2	15	0
Linseed oil, boiled ..	gall.	0	12	6	to	0	13	0
Linseed oil, raw	gall.	0	11	9	to	0	12	0
Portland cement	ton	3	11	0	to	3	13	0
Slates, Bangor	1200	32	0	0	to	35	0	0
Slates, Portmadoc	1200	18	0	0	to	25	0	0
Tiles	1000	6	2	6	to	6	5	0
Turpentine	gall.	0	8	0	to	0	8	6
Yellow pine up to 3x8 ..	standard	45	0	0	to	55	0	0
Yellow pine over 3x8 ..	standard	50	0	0	to	60	0	0

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE

Notice of Dividend

THORNE, Harry Saville, 5, Finkle Street, Selby, late 98, Sackville Street, Barnsley, Yorks., Chemist, &c. Four shillings first and final. September 3rd. Office of G. H. L. Oslaus, Incorporated Accountant, 2, Albion Place, Leeds.

Notice of Intended Dividend

FAWN, Frederick Charles, 27, Claremont Road, Bishopston, Bristol, carrying on business at 348, Gloucester Road, Bristol.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]

SPHINX PETROLEUM CO., LTD., LONDON, E.C. (K. 30/8/19).—Registered August 7 (by order on terms), 300,000 lei (£5,454 10s. 10d.) mortgage, to Banca Romancasca, Bucarest; charged on petrol bearing grounds, &c., at Prahova and Telega. *Nill. December 20, 1918.

ELTON COP DYEING CO., LTD. (K. 30/8/19). Registered August 12, £30,000 mortgage, to Rt. Hon. Mary A. de Trafford, Irwellbank, Eccles, and ors.; charged on hereditaments and premises at Elton, Bury. *£20,000. August 13, 1918.

HOLBECK DYEWORKS CO., LTD. (K. 30/8/19).—Registered August 5, £1,000 debentures part of amount already registered; also registered August 6, £1,000 debentures, to J. Sowden, 1, Blenheim Road, Bradford; general charge. *£2,060. April 23, 1919.

Mortgage Satisfaction

VIKING RENNET CO., LTD (late VIKING CHEMICAL CO., LTD.), LONDON, N.E. (K.S. 30/8/19).—Satisfaction registered August 15, for £300, part of £500, registered July 26, 1912.

Liquidator's Notice

NETTLE'S PHARMACY, LTD.—In voluntary liquidation.—A meeting of creditors will be held at the offices of Trewen & Peter, chartered accountants, 22, Basinghall Street, London, E.C. 2, on September 9, 1919, at 2.30 p.m. The creditors of this company are required, on or before October 6, to send their names and addresses, and the particulars of their debts or claims, and the names and addresses of their solicitors (if any) to William John Peter, 22, Basinghall Street, E.C. 2, liquidator.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. 2.—

ALEXANDER RUSSELL, LTD., King Street, Dukinfield.—To acquire and carry on the business of dyers and dry cleaners. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: A. Russell, 285, King Street, Dukinfield (Managing Director); J. W. Underwood, Old Road, Dukinfield. Qualification of Directors 200 shares.

BRITISH MAGNESITE CALCINING COMPANY, LTD., 14, Great George Street, S.W. 1.—To carry on the business of calciners and burners and grinders, millers and pulverizers of magnesite, chrome, &c. Nominal capital, £100,000 in 100,000 shares of £1 each. Directors: H. Steel, F. W. Cooper, Colonel W. C. Wright, C.B., T. Oleworth, J. R. Horton, Sir W. J. Jones, K.B.E., G. Scolby-Smith, A. Dorman.

BANK BRIDGE WORKS, LTD., 37, Fenchurch Street, E.C.—To acquire and carry on the business of manufacturers and dealers in ebonite, india-rubber, gutta-percha, asbestos, and similar products. Nominal capital, £100,000 in 18,000 Preference Shares and 82,000 Ordinary Shares of £1 each. Directors: B. Keeling, Queen's Hotel, Manchester; J. Lang, 83, The Drive, Hove, Sussex; J. H. Keeling, 105, North Road, Clayton, Manchester; A. F. Keeling, Calderbank, Sandleigh, Withington, Manchester. Qualification of Directors, 10 Preference Shares. Remuneration of Directors £30 each.

CONSOLIDATED MINES OF CORNWALL, LTD., 8, Hart Street, Mark Lane, E.C.—To acquire certain leasehold premises and rights to search for iron, ore, and ironstone, China clay, China stone and mica clay, on lands in Cornwall. Nominal capital, £66,000 in 33,000 7 per cent. Cumulative Preference shares and 33,000 Ordinary shares of £1 each. Directors: H. Van den Breghe (Managing Director); Sir Colman B. W. Rashleigh, Baronet. Qualification of Directors to be voted by company in general meeting.

A. DE ST. DALMAS & CO., LTD., 40½, Belgrave Gate, Leicester.—To acquire and carry on the business of manufacturing chemists, plaster makers and druggists' sundriesmen. Nominal capital, £50,000 in 50,000 shares of £1 each. Directors: H. C. S. Tyler, The Fomestrad, Manor-road, Gadby, Leicester; A. F. E. De St. Dalmas, Iacolena, Lansdown Road, Sidcup, Kent; W. H. E. De St. Dalmas, "Fairfield," 2, Clarendon Park Road, Leicester; A. F. Cholerton, "Wynnstead," Knighton Grange Road, Leicester. Qualification of Directors: A. F. E. De St. Dalmas, 5,000 shares; others to be voted by Company in general meeting.

EGERTONS, LTD., 45-49, Oxford Road, Manchester.—Photographers and dealers in photographic and other films, &c. Nominal Capital £20,000 in 20,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, 1 share. Remuneration of Directors, £5 5s. each meeting.

ELLERINGTON & SCOTT, LTD., 1, Cranbourn Street, W.C.2.—To carry on the business of wholesale and retail and manufacturing chemists and druggists. Nominal capital, £23,000 in 23,000 shares of £1 each. Directors: J. P. Ellerington, The Ivanhoe Hotel, W.C.2.; G. H. Scott, 7B, Clifton Gardens, Maida Vale, W.; all personal directors. Qualification of Directors, 4,000 shares personal directors. Others 500 ordinary shares.

FYLDE BRASS FOUNDRY, LTD., 26, London Street, Fleetwood, Lancaster.—Ironfounders, mechanical engineers, brassfounders, &c. Nominal Capital, £2,000 in 2,000 shares of £1 each. Directors: A. J. McNaught, "Arnside," Rossall Beach, Rossall; T. Clegg, Ashfield Road, Burnley. Qualification of Directors, £100. Remuneration of Directors to be voted by Company in general meeting.

HOVEY & LOWTHER, LTD. Wheelock Mills, Wheelock, near Sunderland, Cheshire. To acquire and carry on the business of manufacturers of phosphoric acid powder. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors: R. B. Hovey, Durham Grange, Bowdon, Cheshire; E. L. Hovey, Durham Grange, Bowdon, Cheshire. Qualification of Directors, £500. Remuneration of Directors, £100 each.

INESON & GIBBS OIL & CHEMICAL CO., LTD., Marshall Works, Milner Road, Selby Park, Birmingham.—Nominal Capital, £3,000 in 3,000 shares of £1 each. Directors: A. Ineson, 117, Westminster Road, Selby Park, Birmingham; H. A. Gibbs, 9, John Street, Handsworth, Birmingham. Qualification of Directors, 100 shares.

KALCHESTER MANUFACTURING CO., LTD., August, 1919. 1, Williamson Street, Reddish, Manchester.—Manufacturing chemists, druggists, drysalts, &c. Nominal Capital, £5,000 in 5,000 shares of £1 each. Directors: W. H. A. Chester, 437, Chester Road, Old Trafford, Manchester; R. P. Chester, Fir Hill, Bowdon, Chester; S. E. Chester, 29, Weston Avenue, New Moston, Manchester; J. Kalensky, 6, George Street, Old Trafford, Manchester. Qualification of Directors, 1 share.

LONDON OPTICAL CO., LTD., 344-54, Gray's Inn Road, W.C. 1.—manufacturing opticians. Nominal Capital, £5,000 in 3,000 Preference shares of £1 each, and 2,000 Ordinary shares of £1 each. Directors: R. W. West, "Studland," Baldock Road, Letchworth; H. W. Bird, "Glentworth," Priest Lane, Shemfield, Essex; A. P. Brown, 5, Radley Road, Tottenham, N. 17; W. C. Mardell, 20, Waterville Road, Tottenham, N. 17. Qualification of Directors: R. W. West, 500 Ordinary shares; others, 10 Ordinary shares.

LYELL, LTD.—Acetylene and general engineers and electricians. Nominal Capital, £5,000 in 5,000 shares of £1 each. Directors: J. C. Lyell, 113, Great Portland Street, W. 1; P. W. Wall, 8, Lower Crescent, Kew Gardens, W. Qualification of Directors, 1 share.

LYSLE DISTRIBUTING AGENCIES, LTD., 9, Gamage Buildings, Holborn Viaduct, E.C.—Manufacturers of, merchants and agents for, toilet and other chemical or medicinal preparations. Nominal Capital, £5,000 in 5,000 shares of £1 each. Directors: J. de Lysle, 244, High Holborn, W.C.; J. Wolff, "The Lodge," Hoop Lane, Golders Green, N.W.; S. Wolff, "The Lodge," Hoop Lane, Golders Green, N.W.; E. Harris, 210, Mile End Road, E. Qualification of Directors, 1 share.

MALCO, LTD., 63, Norfolk Street, Sheffield.—To carry on the business of manufacturers and merchants of cutting oils or compounds, starch substitute, &c. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: B. Andrew, 4, Whitely Wood Road, Sheffield; A. King, 2, Whitely Wood Road, Sheffield; W. Mottershead, 73, Rustlings Road, Sheffield. Qualification of Directors, 100 shares. Remuneration of Directors to be voted by company in general meeting.

MANSSELL & OGAN, LTD., Gloucester Mansions, Cambridge Circus, W.C. 2.—Agents and dealers in electrical apparatus and accessories, scientific, optical and other instruments. Nominal

Capital, £5,000 in 3,500 Cumulative Preference and Participating shares of £1 each, and 1,250 Ordinary shares of £1 each, and 250 Founders shares of £1 each. Directors: M. Mansell, 41, Morley Road East, Twickenham, Middlesex; F. B. Ogan, 3, Manor Road, Selsey, Sussex. Qualification of Directors, 1 share.

MORGAN EBONITE CO., LTD., Empire Works, Oldham Road, Failsworth, near Manchester.—To carry on the business of manufacturers of rubber, rubber substitutes, vulcanite, ebonite, &c. Nominal capital, £30,000 in 30,000 shares of £1 each. Directors: J. Martin, T. Martin, J. McCann (Managing Director), J. Morgan. Qualification of Directors, 500 shares. Remuneration of Directors to be voted by company in general meeting.

PHARMACEUTICALS, LTD., Berners House, Berners Street, W.1.—To carry on the business of manufacturing and wholesale chemists. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: M. V. Litton, 5, Abingdon Court, Kensington, W.8; G. G. Pike, Fairlight, Epsom. Qualification of Directors 1 share. Remuneration of Directors, £100 to be divided.

SMALLWOOD (CHEMISTS), LTD., Scales Buildings, Chopelton Pudsey, Yorkshire.—To acquire and carry on the business of chemists, druggists and opticians. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: B. Smallwood, Springfield Villas, Pudsey, Yorks; Emmie E. Smallwood, Springfield Villas Pudsey, Yorks. Qualification of Directors, £100.

STANDARD TYRE AND RUBBER MANUFACTURERS, LTD., Parliament Mansions, Victoria Street, Westminster, S.W. Rubber Manufacturers. Nominal Capital, £125,000 in 110,000 Ordinary shares of £1 each and 300,000 Deferred shares of 1s. each. Minimum subscription, 7 shares. Directors: G. Lewis, Arronmore, Bushey Hall Road, Bushey, Herts; O. R. Mounsey, Poyle Close, Colnbrook. Qualification of Directors, £100. Remuneration of Directors: £300 Chairman; others, £200 each.

Situations Wanted

(Twenty-seven words, 2s.; every additional nine words, 6d.)

UNIVERSITY COLLEGE, London, Graduate seeks post as Works Manager or Chemist-in-Charge. Four years Chemist-in-Charge of Nitro-Cellulose Factory, G/C and Solubles; Nitric Acid Making; Denitration; Acid Concentration, &c. Organisation of Modern Works' Routine and Returns a strong point.—Apply Box No. 19, CHEMICAL AGE OFFICES, 8, Bouverie Street, E.C. 4.

SALES—Technical Chemist, with sound commercial experience and connection with Paint, Printing Ink, and Linoleum Manufacturers, etc., wishes to act as Technical Representative to a Firm manufacturing products used in above industries.—Box No. 20, CHEMICAL AGE OFFICES, 8, Bouverie Street, E.C. 4.

For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

SPECTROSCOPES, MICROSCOPES, bought, sold, and exchanged. Lis. free. — John Browning, 146, Strand, W.C.

SCIENTIFIC BOOKS AND SERIALS

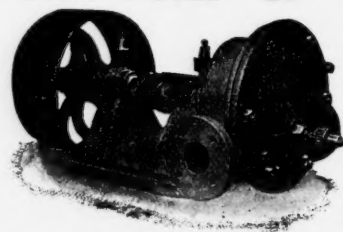
JOHN WHELDON & CO. have the largest stock in the country of Books in all departments of Science (including a large selection on pure and applied Chemistry) and Natural History, also Transactions and Journals of Learned Societies, etc., in sets, runs, and single volumes or numbers.

Libraries or small parcels purchased.
38 GREAT QUEEN STREET, KINGSWAY, LONDON, W.C.2
Telephone: Gerrard 1412.

POSITIVE ACTING ROTARY PUMPS

Called by Explosive Works Engineers

"THE PUMP OF THE WAR."



DUTIES—
ACID
CHEMICALS
WINE
BEER
SOAP SOLUTION
MILK
CHILLED LARD
MARGARINE
COLD BRINE
COLD COAL TAR
PRECIPITATES
BENZOL, &c.

WILLIAM DOUGLAS & SONS, Ltd.,
DOUGLAS WHARF, PUTNEY, LONDON, S.W.15.

E. H. Wrigglesworth

HEAD OFFICE:

4, STORY STREET, HULL.

Telegrams: "Sulphur, Hull."

Telephones: 4633 & 4634.

LIVERPOOL OFFICE:

33, AFRICAN HOUSE, LIVERPOOL.

Telegrams: "Sulphur, Liverpool."

Telephone: 7076 Cent.

SPECIALITIES.

Heavy Chemicals. Fly Catchers.

Fly Gum. Toilet Requisites.

SCRAP Galvanized Iron

New Galvanized Cuttings
and any other Zinc Coated Material

PURCHASED

IN ANY QUANTITY AT HIGHEST PRICES

BY

HENRY LEVIN, WEBB & CO.

York Works, Stratford, E.15

ALSATIAN=POTASH

SOLE AGENTS FOR GREAT BRITAIN AND DOMINIONS:

The Alsace-Lorraine Development and Trading Company, Limited

54, Gresham Street, LONDON, E.C. 3.

According to latest official figures from the Mines, the DAILY production is as follows:—

Kainite 14 per cent. (minimum) Potash	...	...	...	...	2,000 tons.
Concentrated Kainite (Manure Salts) minimum 20 per cent. Potash	...	...	...	...	1,500 "
Chloride of Potassium, 50/60 per cent. Pure Potash	...	...	...	...	250 "

Orders for any quantities promptly executed, and delivered c.i.f. Rotterdam, Amsterdam, or Antwerp within 3 weeks from receipt of orders by the Mines. For further particulars apply to the above Company.

